



Soft but Strong. Neg-Raising, Soft Triggers, and Exhaustification

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Abstract

In this thesis, I focus on scalar implicatures, presuppositions and their connections. In chapter 2, I propose a scalar implicature-based account of neg-raising inferences, standardly analyzed as a presuppositional phenomenon (Gajewski 2005, 2007). I show that an approach based on scalar implicatures can straightforwardly account for the differences and similarities between neg-raising predicates and presuppositional triggers.

In chapters 3 and 4, I extend this account to “soft” presuppositions, a class of presuppositions that are easily suspendable (Abusch 2002, 2010). I show how such account can explain the differences and similarities between this class of presuppositions and other presuppositions on the one hand, and scalar implicatures on the other. Furthermore, I discuss various consequences that it has with respect to the behavior of soft presuppositions in quantificational sentences, their interactions with scalar implicatures, and their effects on the licensing of negative polarity items.

In chapter 5, I show that by looking at the interaction between presuppositions and scalar implicatures we can solve a notorious problem which arises with conditional sentences like (1) (Soames 1982, Karttunen and Peters 1979). The main issue with (1) is that it is intuitively not presuppositional and this is not predicted by any major theory of presupposition projection.

(1) I'll go, if you go too.

Finally, I explore in more detail the question of which alternatives should we consider in the computation of scalar implicatures (chapter 6). Traditionally, the answer has been to consider

the subset of logically stronger alternatives than the assertion. Recently, however, arguments have been put forward in the literature for including also logically independent alternatives. I support this move by presenting some novel arguments in its favor and I show that while allowing new alternatives makes the right predictions in various cases, it also causes an under- and an over-generation problem. I propose a solution to each problem, based on a novel recursive algorithm for checking which alternatives are to be considered in the computation of scalar implicatures and the role of focus (Rooth 1992, Fox and Katzir 2011).

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Chapter 1

Introduction

The utterance of a sentence like (1a) typically gives rise to the inferences in (1b) and (1c).

- (1) a. Not every student read Frank's book on conditionals.
- b. Some student read Frank's book on conditionals.
- c. Frank has a book on conditionals.

(1a) and (1b) exemplify a scalar implicature and a presupposition, respectively, two of the most prominent inferences that we draw from sentences. These inferences lie at the core of our semantic and pragmatic competence, our capacity of understanding and producing meanings in interaction with the context of a given conversation. Their investigation is therefore relevant to the question of the division of labor between pragmatics and grammar, the interplay between content and context, and compositional and non-compositional aspects of meaning. While research on scalar implicatures and presuppositions has always been central to formal semantics and pragmatics, it is currently undergoing a particularly intense phase: many new theories in both areas have brought along with them radical reconsiderations of the issue of the relation between what should be part of the grammar and what should be attributed to pragmatics, re-opening old questions and raising new ones. In this thesis, I follow these recent developments and investigate scalar implicatures and presuppositions by focusing in particular on three ideas that have recently been put forward in the literature and which challenge the traditional bound-

aries between them. The first one is the proposal that some presuppositions should be given an account based on lexical alternatives (Abusch 2002, 2010, Simons 2001). The second idea is that the behavior of the inferences associated with strong scalar terms like *every* is in various ways analogous to that of presuppositions raising the possibility of analysing the latter as scalar implicatures of a sort (Chemla 2009a, in preparation). The third idea is a partial answer to the question of where presuppositions come from, sometimes called the ‘triggering problem’ (Abrusán 2011b,a). Building on these three ideas, I propose a scalar implicature-based account of the so-called ‘neg-raising’ inferences (e.g., the inference from (2a) to (2b)), standardly analyzed as a presuppositional phenomenon (Gajewski 2005, 2007).

- (2) a. John doesn’t think that Bill is in town.
- b. John thinks that Bill isn’t in town.

In particular, I show that an approach based on scalar implicatures can straightforwardly account for the differences between neg-raising inferences and presuppositions, while also accounting for their similarities (CHAPTER 2). In CHAPTERS 3-4, I then extend this scalar implicature-based account to the presuppositions of ‘soft’ triggers, a class of triggers which give rise to presuppositions that are particularly weak and context dependent (Abusch 2002, 2010). I show that in connection with the grammatical theory of scalar implicatures (Chierchia et al. to appear among others) this proposal can account for the differences and similarities between the presuppositions of soft triggers, ‘soft presuppositions’ henceforth, and other presuppositions on the one hand, and scalar implicatures on the other. Furthermore, I discuss a variety of consequences that this proposal has with respect to the behavior of soft presuppositions in quantificational sentences, their interactions with scalar implicatures, and their effect on the licensing of negative polarity items (NPIs). Finally I adopt and adapt Abrusán’s (2011a) solution to the triggering problem in order to give a principled answer to the question of where the lexical alternatives of soft triggers come from. In other words, I propose that in the case of the presuppositions of soft triggers the triggering problem should be reduced to another problem in the literature, which is where alternatives come from (Chemla in preparation, Katzir 2007, Fox and Katzir

2011, Swanson 2010).

Another thread running through this thesis is the exploration of an exhaustification based approach to scalar implicatures and its consequences. In particular, in addition to providing an account of neg-raising inferences and soft presuppositions, I show in CHAPTER 5 that it can also provide a solution to a notorious problem concerning the behavior of certain presuppositions in the antecedent of sentence-final conditionals and other quantificational constructions. The problem was first noticed by Karttunen and Peters (1979) and Soames (1982) and is exemplified by sentences like (3). The main issue with (3) regards the fact that it is intuitively not presuppositional but this is not accounted for by any theory of presuppositions which correctly predict that presuppositions generally project out of the antecedents of conditionals.

(3) I'll go, if you go too.

Finally, I zoom in on alternatives and I explore in more detail the question of which alternatives should we consider in the computation of scalar implicatures (CHAPTER 6). More precisely, scalar implicatures are standardly assumed to arise as negations of a subset of the alternatives of a particular sentence. The question is how should we define this subset. Traditionally, the answer has been to consider the subset of alternatives that are more informative - that is, logically stronger - than the assertion. Recently, however, arguments have been put forward in the literature for including also logically independent alternatives. I support this move by presenting some novel arguments in its favor and then show that while allowing new alternatives makes the right predictions in various cases, it also causes an under- and an over-generation problem. I propose a solution to each problem, based on a novel recursive algorithm for checking which alternatives are to be considered in the computation of scalar implicatures and the role of focus in the computation of scalar implicatures (Rooth 1992, Fox and Katzir 2011 among others). Before a more detailed overview of the chapters of this thesis, I turn now to sketch the version of the grammatical theory of scalar implicatures that I adopt throughout the thesis.

1.1 The grammatical theory of scalar implicatures

In the neo-Gricean approach, implicatures arise through reasoning about what the speaker said and what she could have said instead. This reasoning takes as input the output of compositional semantics and, on the basis of general considerations about rational interactions, it outputs scalar implicatures. In recent years, this approach has been challenged, in particular in its ability to account for when scalar implicatures appear embedded, when they appear to be obligatory and when they appear to interact with polarity items. Each of these cases has been taken as an argument for treating them as part of grammar, computed recursively within the compositional side of meaning (Chierchia 2004, Chierchia et al. To appear, Chierchia to appear, Fox 2007, Magri 2011a). In response to these new proposals substantially refined versions of the standard approaches have been developed (Sauerland 2004, van Rooij and Schulz 2004, Spector 2007b, Geurts 2010, Russell 2012. I will not review this debate here, for discussion and new arguments in favour of the grammatical approach see Fox 2012a and Sauerland 2012; for a recent dissenting view see Russell 2012).

In the following, I adopt a version of the grammatical theory of scalar implicatures. In this theory scalar implicatures arise as entailments of sentences which contain one or more silent exhaustivity operator (Chierchia et al. To appear, Fox 2007 and Magri 2010a among others).¹ This grammatical approach to scalar implicatures will be crucial in particular in the account of intervention effects of soft presuppositions in the licensing of NPIs and in the interactions between soft presuppositions and scalar implicatures (CHAPTER 4). In the following, I review the main ingredients of this approach, starting from the notion of alternatives.

1.1.1 Alternatives

Implicatures like the one in (1c) above are called “scalar” because they correlate with the presence of words or expressions (“scalar items”) that may be viewed as part of an informational

¹See Franke (2011) for a useful comparison between this type of exhaustification-based theories of scalar implicatures and others that do not employ syntactically realized exhaustivity operator like van Rooij and Schulz (2004), Schulz and Van Rooij (2006) and Spector (2006).

scale (Horn 1972, Gazdar 1979, Sauerland 2004 among many others). Where such alternatives come from is an open question, on which I remain neutral (Katzir 2007, Fox and Katzir 2011, Swanson 2010), although I will propose a partial answer to it in the case of the alternatives of soft triggers. I assume that certain items are associated with a set of lexical alternatives and adopt a theory of how they grow to become alternatives of more complex expressions containing them. For concreteness, I make use the formulation of alternatives' growth in (4) and (5), adapted from Chierchia 2004.

- (4) **Basic Clause:** For any lexical entry α , $\mathcal{Alt}(\alpha)^2 =$
- a. $\{\llbracket \alpha \rrbracket\}$ if α is lexical and does not belong to a scale³
 - b. $\{\llbracket \alpha_1 \rrbracket \dots \llbracket \alpha_n \rrbracket\}$ if α is lexical and part of a scale $\langle \llbracket \alpha_1 \rrbracket \dots \llbracket \alpha_n \rrbracket \rangle$
- (5) **Recursive Clause** (pointwise functional application)
- a. $\mathcal{Alt}(\beta(\alpha)) = \{b(a) : b \in \mathcal{Alt}(\beta) \text{ and } a \in \mathcal{Alt}(\alpha)\}$

To illustrate, consider a scalar item like *every*, which is standardly assumed to be associated with the set of lexical alternatives in (7).⁴

- (7) $\mathcal{Alt}(\text{every}) = \{\mathbf{every}, \mathbf{some}\}$

²Where \mathcal{Alt} is a function from expressions to a set of interpretations

³Where a 'scale' is a set of expressions partially ordered by generalized entailment.

⁴An alternative formulation based on Logical Forms rather than interpretations is proposed in Klinedinst 2007 and is summarized in (6a) and (6b).

- (6) For any expression α , the set of alternatives to α , indicated as $\mathcal{Alt}(\alpha)$ is:
- a. $\{\alpha_1 \dots \alpha_n\}$ if α is lexical and part of a scale $\langle \alpha_1 \dots \alpha_n \rangle$
 $\{\alpha\}$ if α is lexical and not part of a scale
 - b. $\{[\beta' \gamma'] : \beta \in \mathcal{Alt}(\beta) \wedge \gamma' \in \mathcal{Alt}(\gamma)\}$, if $\alpha = [\beta \gamma]$

What (6) says is that the alternatives to a complex structure is the set of all possible combinations of replacements of alternatives to lexical items contained in that structure.

Given the definition above, we are now in a position to compute the alternatives of any complex sentence containing *every*. For instance, the alternatives of (8a) are predicted to be those in (8b), while the alternatives of (9a), those in (9b).

- (8) a. Every student came.
b. $\{\mathbf{every}(\mathbf{student})(\mathbf{came}), \mathbf{some}(\mathbf{student})(\mathbf{came})\}$
- (9) a. Not every student came.
b. $\{\neg[\mathbf{every}(\mathbf{student})(\mathbf{came})], \neg[\mathbf{some}(\mathbf{student})(\mathbf{came})]\}$

1.1.2 A covert *only*

The assumption of silent operators in the grammar is a common strategy in the account of a variety of phenomena. For instance, in the literature on plurality, a silent distributivity operator with a meaning akin to *each* is assumed in order to account for the fact that a sentence like (12) is ambiguous between the readings in (13a) and that in (13b). These readings can be obtained by giving different scope to the indefinite *a student* and this silent *each* operator.⁵

- (12) Bill and Sue met a student.
- (13) a. Bill met a student and Sue met a student.
b. There is a student that Bill and Sue both met.

Analogously, in the grammatical approach to scalar implicatures, a covert exhaustivity operator EXH, with a meaning akin to overt *only* is postulated. The semantics of *only* is generally

⁵To illustrate, consider the simplified meaning for the distributive operator in (10).

- (10) $\llbracket \mathbf{EACH} \rrbracket = \lambda P \lambda x. \forall y \in x [P(y)]$

The meanings that we obtain by scoping the **EACH** operator below or above the indefinite are (11a) and (11b), respectively, which correspond to the two readings of (12) in (13a) and (13b).

- (11) a. $\forall y \in \llbracket \text{Bill and Sue} \rrbracket \exists z [\mathbf{student}(z) \wedge \mathbf{meet}(y, z)]$
b. $\exists z [\mathbf{student}(z) \wedge \forall y [y \in \llbracket \text{Bill and Sue} \rrbracket \rightarrow \mathbf{meet}(y, z)]]$

assumed to be that in (14): a function from a proposition p and a set of alternatives C to the negation of an excludable subset of C , only defined if p is true (see Rooth 1992, Beaver and Clark 2009 among many others).⁶

$$(14) \quad \llbracket \text{only}_C \rrbracket(p) = \lambda w : p(w). \forall q \in \mathcal{E}xcl(p) [\neg q(w)]$$

The exhaustivity operator is defined as the non-presuppositional variant of *only* in (15). Like *only* it takes a proposition p and a set of alternatives as arguments and it outputs the negation of an excludable subset of the alternatives. However, instead of presupposing p , it asserts the truth of p .

$$(15) \quad \llbracket EXH_{Alt(p)} \rrbracket(p) = \lambda w. p(w) \wedge \forall q \in \mathcal{E}xcl(p) [\neg q(w)]$$

The question, at this point, is how to define the notion of excludable alternatives. The standard definition is in (17), whereby the excludable alternatives are all and only the ones that are strictly stronger than the prejacent. In CHAPTER 6, I argue that we should move to a notion of exclusion, which, instead, also excludes logically independent alternatives as in (18).⁷

$$(17) \quad \mathcal{E}xcl_{st}(p) = \{q \in \mathcal{A}lt(p) : q \subset p\}$$

$$(18) \quad \mathcal{E}xcl_{nw}(p) = \{q \in \mathcal{A}lt(p) : \lambda w [\neg q(w)] \cap p \neq \emptyset\}$$

Once the exhaustivity operator is assumed, scalar implicatures can be derived as entailments of sentences whose LFs contain one or more exhaustivity operator. To illustrate, consider the case

⁶Following the notation of Heim and Kratzer (1998) I indicate presuppositions as definedness conditions of functions, so that $\lambda\phi : \psi . \chi$ means the function from ϕ to χ defined only if ψ .

⁷I am assuming a notion of entailment appropriately generalized to types that ‘end in t ’ as defined in (16a) and (16b).

(16) **cross-categorial entailment**

- a. For any p and q of type t , $p \subseteq q$ iff $p \rightarrow q$
- b. For any f and g of type $\langle \tau, t \rangle$ and any a_1, \dots, a_n of type τ ,
 $f \subseteq g$ iff $f(a_1), \dots, f(a_n) \subseteq g(a_1), \dots, g(a_n)$

in (19a) and let us go through how we can derive the inference in (19b).

- (19) a. Not every student came.
b. Some student came.

Assuming the LF in (20a), we obtain (19b) via the exhaustification of (19a) with respect to its alternatives in (20b). This is shown in (21).⁸

- (20) a. EXH[not[every student came]]
b. $\text{Alt}(20a) = \left\{ \neg[\text{every}], \neg[\text{some}] \right\}$
- (21) $\llbracket \text{EXH}[\text{not}[\text{every student came}]] \rrbracket(w) =$
 $\llbracket \text{EXH}[\text{not}[\text{every student came}]] \rrbracket(w) \wedge \forall \psi \in \mathcal{E}\text{xcl}(\neg\text{every})(\neg\psi_w) =$
 $\neg\text{every} \wedge \neg\neg\text{some} =$
 $\neg\text{every} \wedge \text{some}$

1.1.3 Excludable Alternatives

I defined the notion of excludable alternatives as in (22): all alternatives that can be consistently negated with the assertion.

$$(22) \quad \mathcal{E}\text{xcl}_{nw}(\phi) = \{\psi \in \mathcal{A}\text{lt}(\phi) : \lambda w[\neg\psi_w] \cap \phi \neq \emptyset\}$$

This definition, however, runs into problems in the case of a disjunction like (23), assuming the alternatives in (24) (Sauerland 2004). Indeed, if we were to simply negate all alternatives in (24) we would get a contradiction: all alternatives but the assertion are non-weaker, in fact stronger, than the assertion. Therefore, negating them all would give us that Paul or Sue came and that not both of them came and also that Paul didn't come and that Sue didn't come. As it is easy to see all these conjuncts cannot be true together.

⁸This kind of scalar implicatures arising from the strongest element of the scale has been called “indirect scalar implicatures” by Chierchia (2004) and “negative implicatures” by Chemla (2009c).

(23) Paul or Sue came

$$(24) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \mathbf{paul\ or\ sue} \\ \mathbf{paul} \\ \mathbf{sue} \\ \mathbf{paul\ and\ sue} \end{array} \right\}$$

We need to refine (22) in such a way that a contradiction is avoided in cases like (23). I adopt the notion of innocent exclusion by Fox (2007).⁹ The basic idea is that we want to exclude as many as non-weaker alternatives as possible, without making an arbitrary choice between them. The definition of innocently excludable alternatives is as follows: firstly, we define a notion of CONSISTENTLY EXCLUDABLE SUBSETS of the alternatives, that are constituted by the alternatives that can be consistently negated with the assertion.¹⁰

(25) A subset $X = \{\psi_1, \psi_2, \dots\}$ of the set of alternatives $\mathcal{Alt}(\phi)$ is a CONSISTENTLY EXCLUDABLE subset with respect to ϕ iff $\phi \wedge \neg\psi_1 \wedge \neg\psi_2 \dots$ is not a contradiction.

Secondly, we are interested in the MAXIMAL ones among these subsets.

(26) A subset $X \subseteq \mathcal{Alt}(\phi)$ is called a MAXIMAL CONSISTENTLY EXCLUDABLE subset of $\mathcal{Alt}(\phi)$ with respect to ϕ iff there is no consistently excludable superset of X in $\mathcal{Alt}(\phi)$

Finally we are in a position to define the INNOCENTLY EXCLUDABLE SUBSET of the alternatives, that is \mathcal{Excl}_{ie} , as all the alternatives in the intersection of all maximal consistently excludable subsets.

(27) $\mathcal{Excl}_{ie}(\phi)$ is the intersection of all maximal consistently excludable subsets of $\mathcal{Alt}(\phi)$

⁹see Chierchia (to appear) for an alternative approach.

¹⁰The way of presenting innocent exclusion here is that in Magri 2010a, see also Fox 2007, Franke 2011, and Nickel 2011.

To illustrate how this definition works, consider again the case in (23) above and take all the maximal consistently excludable subsets of (24) that we can obtain with respect to (23): we have {**paul**, **paul and sue**} and {**sue**, **paul and sue**}. The intersection of these sets winds up being {**paul and sue**}, thus we correctly derive that the only excludable alternative in (24) is (28).

(28) **paul and sue**

Notice that the intuition mentioned above that we want to exclude as many consistently excludable alternatives as possible without deciding among them in an arbitrary way is captured by the requirement that innocently excludable alternatives are only the ones in *every* maximally excludable set. This is because if we were to exclude a consistently excludable alternative that is only in some maximally excludable set it can be shown that it would always be the case that we would be forced to include (not exclude) a different alternative which is in some other maximally excludable set. For instance in (24) above, **paul** is not innocently excludable because **paul or sue** together with the negation of **paul** entails the inclusion of the other alternative **sue**. In the following, I assume the notion of excludability in (27), although for presentational purposes I will sometimes use the simpler (22).

1.1.4 The distribution of EXH

As a syntactic operator, EXH can be inserted at any level of embedding. However, from this it does not follow that its distribution should be completely free (Chierchia et al. (To appear), Fox and Spector (2009)). It is well-known in particular that exhaustification below a downward entailing operator is marked. For instance (29a), typically pronounced with stress on “or”, can be treated as a case of local exhaustification. This is because local exhaustification gives rise to a meaning that is compatible with the continuation that John talked to both Paul and Sue.

- (29) a. John didn’t talk to Paul or Sue, he talked to both of them.
 b. ¬[EXH[John talked to Paul or Sue]] = [John didn’t talk to Paul or Sue] or [he

talked to both Paul and Sue]

One way to account for the markedness of (29a) is to appeal to a version of the strongest meaning hypothesis (Dalrymple et al. 1998)). The idea is that unless forced to by contradictions in the context, we insert EXH only if the resulting meaning is not equivalent or weaker than the one without it (Chierchia et al. To appear). This predicts that (29a) should be marked given that it violates (30).¹¹

- (30) **Minimize Weakness:** Do not insert EXH in a sentence *S* if it leads to an equivalent or weaker meaning than *S* itself.

In the following, I assume that the distribution of EXH is constrained by (30).¹²

1.1.5 Suspension of Scalar Implicatures

One main characteristic of implicatures is their context dependence or ‘optionality’. This can be illustrated by the example in (31a), which generally has the scalar implicature in (31b). The latter, however, can be suspended as in (31c).

- (31) John met some of the students.
(31) John didn’t meet all of the students.
(31) John met some of the students. In fact, he met them all.

How is context dependence to be captured in grammatical approaches? There are three main mechanisms that have been proposed: the optionality of EXH (Fox 2007), restriction of the domain of quantification of EXH (Magri 2010a) and the optional activation of the alternatives (Chierchia 2006, to appear). While any of these analyses can, in principle, be imported to account for the context dependence of soft presuppositions (and neg-raising inferences), I adopt

¹¹This is because for any downward entailing operator *f*, exhaustification above *f* entails exhaustification below it: $\text{EXH}(f(p)) \subseteq f(\text{EXH}(p))$.

¹²This constraint is enough for our purposes, but see Chierchia et al. To appear, Fox and Spector 2009 and Magri 2011b for longer discussion and alternative formulations.

1.1.5.1 Activation of alternatives

(32) a. John did the reading or the homework.
b. EXH[John did the reading or_[+σ] the homework] IMPLICATURE
c. John did the reading or_[-σ] the homework. NO IMPLICATURE

(33) Mary shot the soldier with a gun.

In addition to the grammatical feature-based mechanism, I also assume a pragmatic mechanism based on the notion of relevance. As discussed by van Rooij (2002), Fox and Katzir (2011), Zondervan (2009), Magri (2010a), we can model relevance using questions under discussion.

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The idea is that all assertions can be thought of as answers to (implicit or explicit) questions under discussion (see Roberts 2004, Beaver and Clark 2009 among others). Further, assume that a question is associated with a partition of the common ground (i.e., a set of pair-wise disjoint propositions whose union is the common ground).¹⁴ The notion of relevance is that in (34), where Q is the partition associated with the question (Heim 2011).

(34) **Relevance** A proposition p is relevant to a question Q iff p is (contextually equivalent to) the union of some subset of Q .

What (34) says is that a proposition is relevant if it does not distinguish among the cells of the (partition associated with) the question. By way of illustration consider the question under discussion to be (35a), which corresponds to the partition Q in (35b).

(35) a. Is it raining?
 b. $Q = \{c_1 = \mathbf{rain}, c_2 = \neg \mathbf{rain}\}$

Given the notion of relevance in (34), we predict that (36a) is relevant given the question in (35a), while (36b) is not. This is because the former corresponds to one cell of the partition, while the latter does not correspond to any cell (i.e., both in c_1 and c_2 there are worlds in which John will come and worlds in which John will not come).

(36) a. It's not raining.
 b. John will come.

We can define a subset of the alternatives, the set of “relevant alternatives”, based on this notion of relevance. The set of relevant alternatives is the set of alternatives the interpretations of which is a union of some subset of (partition of the) question under discussion.

(37) Given the partition Q of the question under discussion,

¹⁴This can be the semantics of questions itself or derivable from it (see Heim 1994). For a discussion of the semantics of questions see Hagstrom 2003.

$$\mathcal{Alt}_{\mathcal{R}}(p) = \{q \in \mathcal{Alt}(p) : q \text{ is a cell or a union of cells of } Q\}$$

At this point, we can simply redefine exhaustification as taking relevant alternatives as in (38) and, correspondingly the set of excludable alternatives as in (39).

$$(38) \quad \llbracket \text{EXH}_{\mathcal{Alt}_{\mathcal{R}}} \rrbracket(p)(w) = p(w) \wedge \forall q \in \mathcal{Excl}(p) [\neg q(w)]$$

$$(39) \quad \mathcal{Excl}(p) = \{q \in \mathcal{Alt}_{\mathcal{R}}(p) : \lambda w [\neg q(w)] \cap p \neq \emptyset\}$$

From now on, I assume that the alternatives are relevant alternatives and omit the subscript whenever no confusion could arise.

This notion of relevance can account for the fact that typically we draw the inference to the negation of (40d) from (40c) when the question under discussion is (40a) and not when it is (40b).

- (40) a. How many chairs do you have?
 b. We need two chairs for the faculty meeting. Who has two chairs?
 c. I have two chairs.
 d. I have three chairs.

By way of illustration, (40a) gives rise to the partition of the common ground in (41) in which each line represent a cell of the partition and **exactly n** stands for *I have exactly n chairs* (suppose the maximum number of chairs you can have is four).

$$(41) \quad Q_1 = \left\{ \begin{array}{l} c_1 = \mathbf{zero} \\ c_2 = \mathbf{exactly\ one} \\ c_3 = \mathbf{exactly\ two} \\ c_4 = \mathbf{exactly\ three} \\ c_5 = \mathbf{exactly\ four} \end{array} \right\}$$

We can now see that (40d) is relevant given Q_1 because it is the union of some of its cells (i.e., $c_4 \cup c_5$). Given that it is relevant, it is going to be negated by EXH, so we expect the implicature that I have two but not three chairs.

On the other hand, the question in (41b) gives rise to the partition in (42), where **me** and **john** stand for *John has two (or more) chairs* and *I have two (or more) chairs*, respectively (suppose the only individuals in the context are me and John).

$$(42) \quad Q_2 = \left\{ \begin{array}{l} c_1 = \neg \mathbf{me} \wedge \neg \mathbf{john} \\ c_2 = \mathbf{me} \wedge \neg \mathbf{john} \\ c_3 = \neg \mathbf{me} \wedge \mathbf{john} \\ c_4 = \mathbf{me} \wedge \mathbf{john} \end{array} \right\}$$

Here (40d) is not relevant because it is not the union of any cells of Q_2 , rather it distinguishes within c_2 , providing irrelevant information. In sum, we can account for the pattern in (40), because the alternative (40d) is relevant when (40a) is the question under discussion but not when (40b) is.

Summing up, I am assuming a grammatical feature-based mechanism according to which each scalar term is ambiguous between a version that needs to agree with an exhaustivity operator and one that does not. This mechanism will allow us to define a scalar term that is not ambiguous, but which is obligatorily exhaustified. Furthermore, I am assuming a pragmatic mechanism that reduces alternatives depending on the question under discussion. The integration of these two mechanisms is not a trivial task, but for our purposes it is sufficient to assume the following constraints on their interaction: when the grammatical mechanism allows an ambiguity between scalar terms, then the alternatives are subject to relevance. When instead the grammatical mechanism gives us no choice between active and non-active forms, then relevance plays no role. In other words, I am assuming that when grammar leaves a choice between active and non-active alternatives, the pragmatic mechanism of relevance is allowed to kick in and carve out the set of alternatives depending on the question under discussion. When, on the other hand, it only provides us with obligatorily activated alternatives, then relevance is not taken into

account (see also Chierchia to appear for a similar idea).

Before going to a more detailed overview of the contents of this thesis' chapters, let us briefly go through the logic on an argument for embedded scalar implicatures coming from a felicity condition on disjunctive sentences. This will be useful below in that I use it to test the inferences predicted by the scalar implicature-based approach that I propose. The condition is that in (43) (Hurford 1974; see also Chierchia et al. To appear and Singh 2008c).

(43) **Hurford's constraint:**

A sentence that contains a disjunctive phrase of the form *S* or *S'* is infelicitous if *S* entails *S'* or *S'* entails *S*.

(43) can immediately account for the infelicity of sentences like (44).

(44) #John is in Italy or in Milan.

Hurford (1974) and Gazdar (1979), however, observed that (43) appears to be violated by cases like (45), as the second disjunct is stronger than the first one, but nonetheless (45) is felicitous.

(45) Either John solved some of the problems or he solved them all.

Chierchia et al. (To appear) argue that (45) is not a violation of the Hurford's constraint because we should analyze it with an embedded exhaustivity operator in the first disjunct as in (46a), so that it becomes equivalent to (46b), and hence the second disjunct does not entail the first one.

- (46) a. Either [EXH[John solved some of the problems]] or he solved them all.
b. Either John solved some but not all of the problems or he solved them all.

Chierchia et al. (To appear) use the Hurford's constraint as a diagnostic for (embedded) scalar implicatures. In the following, I use it in a number of occasions to test the inferences predicted by the approach that I am proposing.

1.2 Overview of the Chapters

1.2.1 Chapter 2: A scalar implicature-based approach to Neg-raising

In this chapter, I give an analysis of neg-raising inferences as scalar implicatures. The main motivation for this account as opposed to a presupposition-based approach (Bartsch 1973 and Gajewski 2005, 2007) comes from the differences between presuppositions and neg-raising inferences, noticed by Gajewski (2005, 2007) and Homer (2012a). In response to this issue, Gajewski (2007) argues that neg-raising predicates are soft presuppositional triggers and adopts the account of how their presuppositions arise by Abusch (2002, 2010). However, I argue that there is a difference between soft triggers and neg-raising predicates in their behavior in embeddings; a difference that is straightforwardly accounted for in the present approach. Furthermore, by adopting Abusch's (2010) account of soft triggers, Gajewski (2007) inherits the assumptions of a pragmatic principle of disjunctive closure and of a non-standard interaction between semantics and pragmatics - assumptions that are not needed by the present proposal, which is just based on a regular theory of scalar implicatures. Finally, I show that the arguments that Gajewski (2007) presents in favor of the presuppositional account can be explained also by the scalar implicatures-based approach proposed here.

1.2.2 Chapter 3-4: Soft presuppositions as obligatory scalar implicatures

As mentioned above, presupposition triggers can be divided in two groups, soft and hard, on the basis of whether the presuppositions they give rise to are easily defeasible (Abusch 2002, 2010). I discussed three ideas which have been put forward in the literature in connection with this issue: first, soft triggers should be thought of as non-presuppositional items associated with lexical alternatives (Abusch 2002, 2010; see also Chierchia 2010). Second, the question of where their presuppositions come from can be given a principled answer (Abrusán 2011b,a). Third, the projection behavior of presuppositions can be accounted for by a theory based on scalar implicatures (Chemla 2009a, Chemla in preparation). In these two chapters, following these three ideas, I extend the scalar implicature-based approach explored in CHAPTER 2 to soft

presuppositions. I develop the proposal by focusing on four novel contributions. First, I propose an account of how soft presuppositions are similar and different from hard presuppositions, on the one hand, and scalar implicatures, on the other, based on the notion of obligatoriness of scalar implicatures (Chierchia 2006, to appear, Spector 2007a, Magri 2010a). Second, I discuss how the proposal can account for the projection behavior of soft presuppositions, both from the scope and the restrictors of quantificational sentences, in line with the experimental results reported in Chemla 2009b. Third, I show that by being based on the grammatical theory of scalar implicatures the proposal can account for the intervention effects associated with the presuppositions of soft triggers in the licensing of negative polarity items (Homer 2010, Chierchia to appear). Finally, I show that this approach can account for some puzzling cases arising from the interactions between soft presuppositions and “regular” scalar implicatures.

1.2.3 Chapter 5: Exhaustification as a solution to Soames’ problem

In this chapter, I show that an exhaustification based approach to scalar implicatures provides a way to account for the problems raised by the example in (47), first noticed by Soames (1982).

(47) Nixon is guilty, if Haldeman is guilty too.

There are three issues with (47). First, it is felicitous and does not appear to have presuppositions. However all major theories of presuppositions predict that it should presuppose that Nixon is guilty (Heim 1983, Beaver 2001, Beaver and Krahmer 2001, Schlenker 2007, Schlenker 2009 among many others). Second, a typical way to resolve the problem would be to locally accommodate the presupposition in the antecedent. However, this wrongly predicts tautological truth-conditions for (47); a meaning that we could paraphrase as “Nixon is guilty, if both Haldeman and Nixon are guilty.” Third, Soames (1982) observes that there is a contrast between (47) and (48).

(48) ??If Haldeman is guilty too, Nixon is guilty

As a solution to these three problems, I propose that the presupposition is nonetheless locally accommodated in the antecedent and that furthermore the sentence is also interpreted exhaustively, which gives rise to a non-presuppositional, non-tautological meaning analogous to (49).

(49) Nixon is guilty, only if both Haldeman and Nixon are guilty.

Finally, I argue that the degraded status of (48) is an independent fact rooted in the topic-focus structure of sentence-final conditionals. This proposal can account for the three problems above and it can also be extended to treat related non-presuppositional cases like (50).

(50) I will go, if we go together.

1.2.4 Chapter 6: Under- and over- generation in scalar reasoning

In the standard Gricean approach, scalar implicatures arise from the hearer reasoning about relevant stronger alternatives that the speaker could have uttered (Grice 1975; see also Gamut 1991). Recently, however, various cases have been pointed out in the literature, for which reasoning only over stronger alternatives fails to predict inferences that are intuitively attested and that could be derived if we were to add also logically independent alternatives in scalar reasoning (see Spector 2007a and Chierchia et al. (To appear) among others). In this chapter, I first summarize the existing arguments for logically independent alternatives and present some novel ones coming from sentences with existential modals and from the phenomenon of so-called “free choice permission” (Fox 2007). I then show that while allowing logically independent alternatives makes the right predictions in such cases, it also causes both an under-generation and an over-generation problem (see also Fox 2007:fn. 35 and Magri 2010a). I propose a solution to the over-generation problem based on a novel recursive algorithm for checking which alternatives are to be considered in the computation of scalar implicatures. The gist of the idea is that alternatives are not considered altogether at the same time, but rather through a recursive algorithm that proceeds in steps and decide at each step which alternatives is to be included in the computation of scalar implicatures. I also argue for a solution to the under-generation

problem based on the role of focus in the computation of scalar implicatures (Rooth 1992, Fox and Katzir 2011). Finally, I discuss and compare the proposal of this chapter with the ones of Fox (2007) and Chemla (in preparation).

Chapter 2

A scalar implicature-based approach to neg-raising inferences

2.1 Introduction

It is an old observation in the literature that certain sentence embedding predicates such as *think* and *want* interact with negation in a surprising way: when negated, these predicates are generally interpreted as if the negation was taking scope in the embedded clause. In brief, sentences like (1a) and (2a) are generally interpreted as (1b) and (2b), respectively.

- (1) a. John doesn't think Bill left.
b. John thinks Bill didn't leave.
- (2) a. John doesn't want Bill to leave.
b. John wants Bill not to leave.

The traditional name for this phenomenon is “neg-raising”, and predicates like *think* and *want* are called “neg-raising predicates”.¹ The fact that the sentence with wide scope negation appears to imply the one with narrow scope is not predicted by the standard semantics of such

¹Beyond *think* and *want*, there are many other neg-raising predicates, the following in (3) is a list from Horn 1989.

predicates.² Furthermore, other sentence-embedding predicates do not exhibit this property; compare (1a) and (2a) above with a sentence with a non-neg-raising predicate like *be certain* in (6a): the latter does not imply at all the corresponding sentence with internal negation in (6b).

- (6) a. John isn't certain that Bill left.
b. John is certain that Bill didn't leave.

There are three main approaches to neg-raising in the literature: a syntactic, an implicature-based, and a presuppositional approach. The syntactic approach, which also gave the name to the phenomenon, postulates that in a sentence like (1a) above negation is actually generated in the embedded clause and interpreted there, but it then raises above the predicate and appears linearly before it (Fillmore 1963 among others). I do not discuss the syntactic approach here, for compelling arguments against it see Horn 1978, Gajewski 2005, 2007, and Homer 2012a. An alternative approach is a pragmatic analysis in terms of a type of implicature (Horn 1978). Horn (1989) calls such implicatures “short-circuited implicatures”, implicatures that would be in principle calculable but in fact are conventional properties of some constructions. The main problem of this account is that there does not appear to be any independent motivation for this

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- (3) a. *believe, suppose, imagine, expect, reckon, feel*
b. *seem, appear, look like, sound like, feel like*
c. *be probable, be likely, figure to*
d. *intend, choose, plan*
e. *be supposed to, ought, should, be desirable, advise, suggest*

See Horn 1978 for a general introduction to neg-raising and Homer 2012a for an extensive discussion of neg-raising modals.

²The standard way to analyze such predicates, originally proposed by Hintikka (1969), is as universal quantifiers over possible worlds, restricted to some modal base. So for instance the semantics of *believe* is in (4), where M is a function from worlds and individuals to sets of worlds, in this case the set of worlds compatible with the beliefs of a in w .

$$(4) \quad \llbracket \text{believe} \rrbracket (p)(a)(w) = \forall w' \in M(w, a)[p(w)]$$

It is clear that negating (4) as in (5a) is not equivalent to (5b), where negation takes narrow scope.

- (5) a. $\neg[\forall w' \in M(w, a)[p(w)]]$
b. $\forall w' \in M(w, a)[\neg p(w)]$

type of calculable but conventional implicatures (for extensive discussion of the implicature-based account see Gajewski 2005). The presupposition-based approach is defended in Bartsch 1973 and Gajewski 2005, 2007 and, as I discuss below in detail, is successful in accounting for a variety of data relating to neg-raising. However, it also faces the problem of explaining why the presupposition that it postulates does not behave like other presuppositions in embeddings other than negation. Gajewski (2007) tries to overcome this problem by connecting neg-raising predicates to “soft” presuppositional triggers, in the sense of Abusch (2002, 2010), a class of triggers whose presupposition is particularly weak and context-dependent, which I discuss extensively in CHAPTERS 3 and 4. I argue that, nonetheless, the behavior of neg-raising predicates is different from that of this class of presuppositional triggers. Furthermore, as I discuss below, by adopting Abusch’s (2010) account of soft triggers, Gajewski (2007) inherits some empirical issues and extra non-standard assumptions about the semantics-pragmatic interface associated with that view.

In this chapter, following ideas in Chemla 2009a and Abusch (2002, 2010), I propose a scalar implicature-based account of the inferences associated with neg-raising predicates (“neg-raising inferences”, henceforth). I discuss two main arguments which favor this approach over the presuppositional one: first, it can straightforwardly account for the differences between neg-raising predicates and presuppositional triggers. Second, it is based on an independently justified theory of scalar implicatures and it does not need to adopt the system in Abusch 2010, which, as I discuss below, has conceptual and empirical problems. Finally, I show that it can also account for those aspects of the behavior of neg-raising inferences that do appear presuppositional. While being based on implicatures, the account that I propose is different from Horn’s (1978) in that it only uses regular and independently motivated scalar implicatures.

This chapter is organized as follows: in section 2.2, I summarize the version of the presuppositional approach by Gajewski (2005, 2007) and the account of soft triggers by Abusch (2010) that he adopts. In section 2.3, I discuss the aspects of the behavior of neg-raising predicates that the presuppositional approach gets right and those that it gets wrong. The latter constitute the

motivations for the scalar implicature-based analysis of neg-raising that I outline in section 2.4. In section 2.5, I discuss its predictions and in particular how the proposal accounts for the differences between neg-raising inferences and presuppositions. In section 2.6, I show how it can also account for what the presuppositional account can explain with respect to the suspension of neg-raising inferences, the interaction with polarity, the neg-raising inferences from the scope of negative quantifiers and negated universals, and the behavior of stacked neg-raising predicates. I conclude the chapter in section 2.7. Finally, in appendix A, I explore the interaction between neg-raising inferences and conditional perfection, in section B, I discuss an open issue connected to the treatment of stacked neg-raising predicates that I propose in this chapter, and in Appendix C, I summarize the recent approach to the licensing of the so-called “strong” negative polarity items (Gajewski 2011, Chierchia to appear) and I show that neg-raising desire predicates constitute a challenge for this approach. Finally, I propose a tentative solution to it.

2.2 The presuppositional approach

2.2.1 The excluded middle as a presupposition

Bartsch (1973) proposes a presuppositional account of neg-raising. The idea is that a sentence like (7a), schematized as in (7b), presupposes the so-called excluded middle proposition in (7c), something that in the case of (7a) we could paraphrase as “John has an opinion as to whether Bill is here”.

- (7) a. John believes that Bill is here.
 b. **believe_j**(p)
 c. **believe_j**(p) \vee **believe_j**(\neg p)

The positive case is not particularly interesting, because (7c) is entailed by (7b). However, when we negate (7a) as in (8a), under the assumption that presuppositions project through negation, we obtain the result in (8d). This is obtained because (8b) together with its presupposition in (8c) entails (8d) (if it’s false that John believes that Bill is here and he has an opinion as to

whether Bill is here or not, then he must believe that Bill is not here).

- (8) a. John doesn't believe that Bill is here.
- b. $\neg \mathbf{believe}(p)$
- c. $\mathbf{believe}_j(p) \vee \mathbf{believe}_j(\neg p)$
- d. $\mathbf{believe}_j(\neg p)$

One problem that Bartsch's (1973) purely pragmatic approach faces is accounting for why certain predicates allow neg-raising and others do not (for instance why is *want* in English neg-raising, while *desire* is not?). Furthermore, neg-raising predicates also present cross-linguistic variation: for instance, *hope* is not neg-raising in English, while its counterpart in German, *hoffen*, is neg-raising (see Horn 1989 and Gajewski 2007). In other words, whether a predicate is neg-raising appears to be a matter of conventional properties of such predicate and is not based on general pragmatic assumptions.³

Gajewski (2005, 2007) adopts Bartsch's (1973) approach and improves on it in two respects. First, in response to the issue of conventionality just mentioned, he proposes that the excluded middle should be thought of as a semantic presupposition, lexically specified for certain predicates. As a lexically encoded property, it is then expected that it can be subject to cross linguistic variation. The semantics of a neg-raising predicate *P* is given schematically in (9).⁴

$$(9) \quad \llbracket P \rrbracket = \lambda p \lambda x : [\mathbf{P}(p)(x) \vee \mathbf{P}(\neg p)(x)] . \mathbf{P}(p)(x)$$

While this move offers a way to accommodate the conventionality of neg-raising predicates, it also gives rise to the issue of why neg-raising inferences are context dependent. Indeed, we can easily create contexts which suspend them. For instance, in a context like (10a), (10b) does not imply (10c) (from Bartsch (1973), reported in Gajewski (2007)).

³But see Homer 2012a for some suggestions on how to account for the source of neg-raising inferences in a purely pragmatic way.

⁴I use Heim and Kratzer's (1998) notation, so that $\lambda \phi : \psi . \chi$ indicates the function from ϕ to χ only defined if ψ .

- (10) a. *Bill doesn't know who killed Caesar. Furthermore, Bill isn't sure whether or not Brutus and Caesar lived at the same time, so naturally*
 b. Bill doesn't think Brutus killed Caesar.
 c. Bill thinks Brutus didn't kill Caesar.

In response to this issue, Gajewski (2007) argues that neg-raising predicates are soft presuppositional triggers and that this would account for their context dependence. In the following section, I turn to the connection between neg-raising and soft triggers and I summarize Gajewski's (2007) proposal.

2.2.2 Connecting neg-raising and soft triggers

2.2.2.1 Soft triggers

As I discuss in detail in CHAPTERS 3 and 4, presupposition triggers can be divided into two groups, soft and hard, on the basis of whether the presuppositions they give rise to are easily defeasible (Abusch 2002, 2010). A paradigmatic example of a soft trigger is *win* whereas an example of a hard one is *it*-clefts: a sentence with *win* like (11a), its negation in (11b), and a conditional with (11a) embedded in the antecedent like (11c), give rise to the inference in (11d). Analogously, (12a)-(12c) give rise to the inference in (12d).

- (11) a. Bill won the marathon.
 b. Bill didn't win the marathon.
 c. If Bill won the marathon, he will celebrate tonight.
 d. Bill participated in the marathon.
- (12) a. It was Mary who broke that computer.
 b. It wasn't Mary who broke that computer.
 c. If it was Mary who broke that computer, she should repair it.
 d. Somebody broke that computer.

Another way to look at the pattern above is by taking (11d) and (12d) as inferences of (11a) and (12a) respectively, and showing that they project regardless of whether they are embedded under negation or in the antecedent of a conditional. This projection behavior is what is generally taken to be the main characteristic of presuppositions.⁵ Arguably, the best way to distinguish between soft and hard triggers is what Simons (2001) calls “the explicit ignorance test”. The recipe is to create a context in which the speaker is manifestly ignorant about the presupposition; triggers that do not give rise to infelicity in such contexts are soft triggers. Consider the following two examples modeled on Abusch 2010 that show that according to this diagnostic *win* and *it*-clefts are indeed soft and hard triggers respectively.

(13) I don’t know whether Bill ended up participating in the Marathon yesterday
but if he won, he is certainly celebrating right now.

(14) I don’t know whether anybody broke that computer
#but if it is Mary who did it, she should repair it.

Notice that the presupposition can be suspended even if the speaker does not say explicitly that she is ignorant about the presupposition associated with a soft trigger. However, it has to be evident from the context that she is. Consider the following example in (15) and assume it is a conversation between two people who are meeting for the first time (from Geurts (1995) reported in Simons (2001)): the presupposition of *stop*, i.e. that the addressee used to smoke, is clearly not present.

(15) I noticed that you keep chewing on your pencil. Have you recently stopped smoking?

In sum, there is a class of presuppositions that can be suspend in a context that supplies the relevant information about the speaker’s epistemic state.⁶ In the next subsection, I summarize

⁵For an introduction to presuppositions see Chierchia and McConnell-Ginet 2000 and Beaver and Geurts To appear.

⁶In the following, extending Abusch’s (2002) terminology, will refer to the presuppositions of soft and hard triggers as “soft presuppositions” and “hard presuppositions”, respectively.

Abusch’s (2010) alternatives-based account of the presupposition of soft triggers, “soft presuppositions” henceforth, and some of the problems that it faces. Then I turn to Gajewski’s (2007) account of neg-raising predicates as soft triggers.

2.2.2.2 Abusch 2010

Abusch (2002, 2010) proposes a pragmatic account of soft presuppositions based on lexical alternatives. The architecture of her proposal is as follows: the semantics of a soft trigger does not contribute a semantic presupposition but rather it provides a set of lexical alternatives; the pragmatic side is constituted by a principle that operates on these alternatives. The flexibility and defeasibility of soft presuppositions comes from the context sensitivity of the pragmatic principle. In slightly more detail, she assumes that the alternatives of soft triggers are intuitively contrastive terms, so that, for instance, *win* and *lose* are alternatives to each other. These lexical alternatives grow compositionally similarly to what is assumed in focus semantics, ultimately giving rise to sentential alternatives (see CHAPTER 1, section 1.2.1). For instance (16a), schematized in (16b), has the alternatives in (16c)

- (16) a. Bill won.
 b. **won**(b)
 c. $\text{Alt}(16b) = \left\{ \text{won}(b), \text{lost}(b) \right\}$

On the pragmatic side, Abusch (2010) assumes a pragmatic default principle, which requires the disjunction of the set of alternatives, indicated as $\vee \text{Alt}$, to be true. Given the alternatives assumed, their disjunction entails what is generally assumed to be the soft presupposition. For instance, disjunctive closure applied to the alternative set in (16c) gives rise to the entailment that Bill participated - that is (17a) entails (17b).

- (17) a. $\vee \{ \text{won}(b), \text{lost}(b) \} = (\text{won}(b) \vee \text{lost}(b))$
 b. **participated**(b)

The inferences of soft triggers in unembedded cases are derived by using lexical alternatives and a pragmatic principle of disjunctive closure operating on them. Assuming that they are generated in this way, however, raises the question of how such presuppositions should project. Indeed, one of the main challenges associated with soft triggers is explaining the fact that even if they are different from hard triggers with respect to defeasibility, they appear to project in very similar ways.⁷ In other words, a theory that can account for their defeasibility, still has to provide an explanation for the projection patterns. In relation to this Abusch (2010) assumes a dynamic framework along the lines of Heim 1983 and crucially formulates her pragmatic principle in such a way as to make reference to the local contexts created by the context change potentials of the dynamic meanings that make up the sentences. The definition of the principle is in (18).

- (18) If a sentence ψ is uttered in a context with common ground c and ψ embeds a clause ϕ which contributes an alternative set \mathcal{Alt} , then typically c is such that the corresponding local context d for ϕ entails that some element of \mathcal{Alt} is true.

The local contexts referred to in (18) are those information states created by the dynamic compositional semantics she assumes. I refer the reader to Abusch's (2010) paper for the details, but what is relevant for us is that this strategy effectively mimics the projection behavior of semantic presuppositions, by applying the pragmatic default globally, in a way that makes reference to the local context of the trigger. In other words, the principle in (18) applies to full sentences, at the global level, but makes reference to local contexts that are created during the composition of such sentences. Notice that this last assumption is at odds with standard assumptions about the semantics-pragmatics interface, whereby pragmatics only has access to the output of the semantics, generally thought to be a proposition (or a set of propositions). Here instead we would need a way to keep track of the history of the semantic composition in terms of context change potentials and then make this visible to pragmatics.

⁷As I discuss in CHAPTER 3, there are differences between their projection behavior in quantificational contexts.

Beyond this conceptual point, there are two empirical problems connected to the way soft presuppositions project in Abusch's (2010) system: first, as I discuss in CHAPTER 3 in detail, soft and hard presuppositions pattern differently with respect to the projection behavior in quantificational sentences. In her system, the projection behavior of soft presuppositions exploits indirectly the one of hard presuppositions, so the former is predicted to be identical to the latter, and no difference is expected between them with respect to projection. Second, a further problem for this account was pointed out by Sauerland (2008), who observed that when a soft trigger is embedded under another, the disjunctive closure of the combination of alternatives gives rise to an inference that is too weak. As he discusses, a sentence like (19a), which contains the soft triggers *win* and *stop*, has intuitively the inference in (19b). However, the disjunctive closure of the alternatives in (19c) only gives rise to (19d).⁸

- (19) a. John stopped winning
b. John used to win
c. $\text{Alt}(19a) = \left\{ \begin{array}{l} \text{stop}(\text{win}(j)), \text{stop}(\text{lose}(j)) \\ \text{continue}(\text{win}(j)), \text{continue}(\text{lose}(j)) \end{array} \right\}$
d. John used to participate

Notice that in this case the inference in (19b) is an entailment of (19a) as shown by (20), so Abusch (2010) could appeal to this entailment to account for the intuition that (19a) leads to the inference in (19b).

- (20) John stopped winning #but he didn't used to win.

However, this would not help her in the case of (21a), which does not entail (21b), but still has (21b) as an inference.

⁸Abusch (2010) does not include anymore *stop* in the list of triggers that she discusses, contrary to Abusch (2002). The problem is however general and it applies to any case of a soft trigger embedded into another. Furthermore, if her theory is not meant to apply to aspectuals or factives, it is not anymore an account of soft triggers as identified by the explicit ignorance test above, but rather an account of a subset of them, for which, however, she does not specify a criterion of identification.

- (21) a. John didn't stop winning
b. John used to win

As Sauerland (2008) shows, the problem generalizes to all sentences which contain more than one soft presupposition.⁹

2.2.2.3 Gajewski 2007

Following Abusch (2002, 2010), Gajewski (2007) proposes that neg-raising predicates are also soft triggers and stipulates that the alternatives of a neg-raising predicate are the corresponding predicates with internal negation; hence, a predicate like *believe* would have *doubt* (=believe-not) as its alternative, while a predicate like *want* would have *want-not*. As shown in (23a)-(23d), once we apply the principle of disjunctive closure proposed by Abusch (2010) over these alternatives we obtain as an inference the excluded middle proposition that Bartsch (1973) postulates directly as a presupposition. Once generated, this inference is predicted to project as a presupposition, in the way described above.

- (23) a. John believes that Bill left.
b. **believe_j**(p)
c. $\text{Alt}(\mathbf{believe}_j(p)) = \left\{ \begin{array}{l} \mathbf{believe}_j(p) \\ \mathbf{believe}_j(\neg p) \end{array} \right\}$
d. $\forall \{\mathbf{believe}_j(p), \mathbf{believe}(\neg p)\} = (\mathbf{believe}_j(p) \vee \mathbf{believe}(\neg p))$

⁹In response to this, Abusch (p.c. to Sauerland) suggests that the pragmatic principle should apply every time a soft trigger is encountered. This would ensure that there would never be a combination of the alternatives of soft triggers. However, given the assumption that the alternatives of soft triggers grow compositionally, the same problem would arise with other alternative bearers like scalar terms. For instance, in the case of (22a) the predicted inference is only (22b) and not the intuitively correct (22c).

- (22) a. (Now that he is retired), John didn't stop meeting all the students
b. John used to meet some of the students
c. John used to meet all of the students

In sum, by adopting Abusch's (2010) account, Gajewski (2007) provides an analysis of neg-raising predicates as soft triggers. However, he inherits the extra assumptions of Abusch's (2010) system, the disjunctive closure and the non-standard semantics/pragmatics interface, and its empirical problems discussed above. The fact that the approach that I propose below does not need these extra assumptions constitutes an advantage over Gajewski's (2007) account.

2.3 Predictions

2.3.1 What the presuppositional approach gets right

The presuppositional approach can successfully account for four aspects of the behavior of neg-raising predicates. In the following, I summarize each of them and briefly show how they are predicted by the presuppositional account.

The first aspect, observed by Gajewski (2005), regards the fact that the inference associated with a neg-raising predicate in the scope of negation is hard to suspend, in a way that resembles the markedness of presupposition cancellation in such environments. For instance, there is a contrast between (24a) and (24b)/(24c), which shows that canceling neg-raising requires a special intonation, like stress on the auxiliary or on the predicate.

- (24) a. John doesn't think that it is raining, #he is not sure.
 b. John DOESN'T think that it is raining, he is not sure.
 c. John doesn't THINK that it is raining, he is not sure.

The second aspect regards the inferences that neg-raising predicates give rise to when embedded in the scope of negative quantifiers and negated universals: from a sentence like (25a) we typically draw the universal inference in (25b), while in the case of a negated universal sentence like (26a), the inference that we draw is (26b).¹⁰

¹⁰Homer (2012a) calls the inference in (26b) "wide-scope existential quantification reading" and takes it as characteristic of neg-raising predicates, using it as a diagnostic of neg-raising in his investigation of modals.

- (25) a. No student thinks that Mary passed.
- b. Every student thinks that Mary didn't pass.
- (26) a. Not every student thinks that Mary passed.
- b. There are some students who think that Mary didn't pass.

The third aspect has to do with the licensing of certain NPIs. NPI licensing is a useful tool in the analysis of neg-raising predicates, as it backs up the often subtle judgements about neg-raising inferences. The standard assumption about NPIs is that they are licensed in downward entailing (DE) environments (Ladusaw 1979; cf. CHAPTER 4). A DE environment is the scope of a DE function, which can be defined as in (27).¹¹

- (27) A function f is downward entailing iff for any α, b in the domain of f such that $\alpha \subseteq b$, then $f(b) \subseteq f(\alpha)$.

Negation is a DE function, as shown by the fact that (28a) entails (28b) and (29b) entails (29a).

- (28) a. It rained hard.
- b. It rained.
- (29) a. It didn't rain hard.
- b. It didn't rain.

A subset of NPIs, so-called “strict” or “strong” NPIs, are licensed only in some DE environments. Zwarts (1998) proposes that the characteristic property of the members of such the environments that license strong NPIs is anti-additivity (but see appendix C for a different, more recent, hypothesis on the licensing of strict NPIs, defended in Gajewski 2011 and Chierchia to appear). An anti-additive environment is the scope of an anti-additive function, defined in (30).

- (30) A function f is anti-additive iff for any α, b in the domain of f , $f(\alpha) \wedge f(b) \subseteq f(\alpha \vee b)$

¹¹from Gajewski 2007, where \subseteq indicates cross-categorical entailment as defined in CHAPTER 1.

As shown by the validity of the inference from (31a) to (31b), negation is also an anti-additive function.

- (31) a. It didn't rain and it didn't snow.
- b. It didn't rain or snow.

It was noticed in Lakoff 1969 that strict NPIs show a difference between neg-raising and non-neg-raising predicates, in that they are licensed when embedded under a negated neg-raising predicate, like in (32a), but they are not when in the scope of a non-neg-raising one, like in (32b).

- (32) a. John doesn't think that Mary will arrive until tomorrow.
- b. *John isn't certain that Mary will arrive until tomorrow.

Furthermore, strict NPIs are licensed in the scope of neg-raising predicates embedded under negative quantifiers, as in (33).

- (33) No student thought that Mary would arrive until tomorrow.

The fourth aspect regards the behavior of stacked neg-raising predicates. Fillmore (1963) originally observed that neg-raising operates cyclically. In other words, a sentence like (34a), in which negation appears before a sequence of stacked neg-raising predicates, gives rise to the neg-raising inference in (34b).

- (34) a. I don't imagine Bill thinks Mary wants Fred to leave.
- b. I imagine Bill thinks Mary wants Fred not to leave.

Horn (1971), however, observes that the cyclicity is only partial: the generalization appears to be that neg-raising belief predicates embedding neg-raising desire ones allow cyclicity, while desire-predicates embedding belief-ones do not.

- (35) a. I don't believe Bill wanted Harry to die. \rightsquigarrow
 b. I believe Bill wanted Harry not to die.
- (36) a. I don't want Bill to believe Harry died \nrightarrow
 b. I want Bill to believe Harry didn't die.

The NPI licensing also reveals this pattern as shown by (37a) and (37b) (from Gajewski 2007).¹²

- (39) a. I don't believe John wanted Harry to die until tomorrow.
 b. *I don't want John to believe Harry died until yesterday.

In sum, there are four aspects of the behavior of neg-raising predicates, which, as I discuss below, can be accounted for if we treat them as presuppositional triggers: (a) the fact that the neg-raising inferences are hard to cancel (b) the inferences they give rise to from the scope of negative quantifiers and negated universals, (c) the licensing of strong NPIs, and (d) the behavior of stacked neg-raising predicates. Gajewski (2007) shows that the presuppositional approach can account for these four aspects of the behavior of neg-raising predicates. Let us go through each of them in the following.

First, the fact that presuppositions are hard to cancel under negation appears to be parallel to what happens with neg-raising inferences.¹³ (40b) appears parallel to the case of a presuppositional triggers like *discover*, as (41a) and (41b) show.

- (40) a. John doesn't think that it is raining, #he is not sure.
 b. John DOESN'T think that it is raining, he is not sure.

¹²Other doxastic and bouletic/deontic predicates behave similarly.

- (37) a. Mary doesn't think Bill should have left until yesterday.
 b. *Mary shouldn't think Bill left until yesterday.
- (38) a. Bill doesn't imagine Sue ought to have left until yesterday.
 b. *Bill ought not imagine Sue left until yesterday.

¹³Notice that this applies even if Gajewski (2007) argues that neg-raising predicates are soft triggers, since also these triggers, like *discover*, appear hard to suspend under negation.

- (41) a. John didn't discover that he was accepted, #he wasn't.
 b. John DIDN'T discover that he was accepted, he wasn't.

Second, if we assume that presuppositions in the scope of negative quantifiers project universally (see Heim 1983 and Chemla 2009a for discussion), the prediction for the meaning of a sentence like (42a) are (43a) with the presupposition in (43b). (43a) and (43b) together entail (43c). In other words, Gajewski (2007) can derive the universal inference in (42b) (= (43c)).

- (42) a. No student thinks that he was accepted.
 b. Every student thinks that he wasn't accepted.
- (43) a. $\neg \exists x[\text{student}(x) \wedge \text{thinks}_x(p)]$
 b. $\forall x[\text{student}(x) \rightarrow (\text{thinks}_x(p) \vee \text{think}_x(\neg p))]$
 c. $\forall x[\text{student}(x) \rightarrow \text{think}_x(\neg p)]$

The presuppositional account also makes the right predictions in the case of negated universal sentences: (44a), schematized as in (45a), together with the presupposition in (45b), entails (45c), which is the intuitively correct inference in (44b).

- (44) a. Not every student thinks that he was accepted.
 b. Some student thinks that he wasn't accepted.
- (45) a. $\neg \forall x[\text{student}(x) \rightarrow \text{thinks}_x(p)]$
 b. $\forall x[\text{student}(x) \rightarrow (\text{thinks}_x(p) \vee \text{think}_x(\neg p))]$
 c. $\exists x[\text{student}(x) \wedge \text{think}_x(\neg p)]$

Third, it can be shown that the presuppositional approach predicts that cases like (49) and (50) are anti-additive environments, thus the fact that strong NPIs are licensed in these environments is predicted.¹⁴

¹⁴As Gajewski (2007:p.304) discuss, consider the meaning of a neg-raising predicate P as in (46) (where \Box has to be understood to range over the modal base of the neg-raising predicate P, see fn.3 above).

- (49) John doesn't think that Mary would arrive until tomorrow.
- (50) No student thinks that Mary would arrive until thursday.

Finally, Gajewski (2007) shows that the presuppositional account can also derive the behavior of partial cyclicity. The reason why it predicts it lies in the different way presuppositions project from belief- versus from desire-predicates. Consider embedding a sentence, like (51a), which presupposes (51b), into *think* and *want*, as in (52a) and (52b), respectively. The observation is that both (52a) and (52b) appear to presuppose (52c) and crucially (52b) does not presuppose (52d) (see Heim 1992 and Beaver and Geurts To appear for discussion).

- (51) a. Bill will sell his cello.
b. Bill has a cello.
- (52) a. Bill thinks he will sell his cello.
b. Bill wants to sell his cello.
c. Bill thinks he has a cello.
d. Bill wants to have a cello.

This asymmetry in projection between *think* and *want* is what allows Gajewski (2007) to derive

-
- (46) $\llbracket \text{not } P \rrbracket(p)(x) =$
a. *presupposes* : $[\Box p \vee \Box \neg p]$
b. *asserts* : $\neg \Box p$
c. together (46a) and (46b) entail: $\Box \neg p$
- (47) $\llbracket \text{not } P \rrbracket(q)(x) =$
a. *presupposes* : $[\Box q \vee \Box \neg q]$
b. *asserts* : $\neg \Box q$
c. together (47a) and (47b) entail: $\Box \neg q$
- (48) $\llbracket \text{not } P \rrbracket(p \vee q)(x) =$
a. *presupposes* : $[\Box(p \vee q) \vee \Box \neg(p \vee q)]$
b. *asserts* : $\neg \Box(p \vee q)$
c. together (48a) and (48b) entail: $\Box \neg(p \vee q)$

(46) and (47) entails that no world is a $(p \vee q)$ -world, hence the presupposition of (48) is satisfied and (48) must be true. The presuppositional account, then, predicts that negated neg-raising predicates create anti-additive contexts.

the pattern above (see Gajewski 2007 and Homer 2012a for detail).

In sum, the presuppositional account successfully accounts for the four aspects of the behavior of neg-raising predicates presented above. However, as I discuss now, the presuppositional account does not predict any difference between soft presuppositions and neg-raising inferences, contrary to what appears to be the case.

2.3.2 What the presuppositional approach gets wrong

The main problem for a presupposition approach to neg-raising is the fact that there is very little evidence that the proposition assumed to give rise to neg-raising, the excluded middle proposition, has a presuppositional status. As Gajewski (2005:68) says, “the evidence turns out to be mixed, tending towards suggesting that neg-raising predicates are not presuppositional.” Recall that the standard test for presuppositionality is the projection behavior, that is the phenomenon exemplified by (53a), which presupposes (53b) in the same way as complex sentences embedding (53a) like (53c)-(53f) do.

- (53)
- a. It was Mary who killed Bill.
 - b. Somebody killed Bill.
 - c. It wasn't Mary who killed Bill.
 - d. If it was Mary who killed Bill, she should confess.
 - e. Perhaps it was Mary who killed Bill.
 - f. Was it Mary who killed Bill?

Negation aside, however, the rest of the projection behavior of the excluded middle does not look presuppositional. Compare the cases in (53d)-(53f) above, with the ones in (54d)-(54f): the inference from the latter to (54b) is extremely weak, if it is there at all.

- (54)
- a. Bill thinks that Sue is here.
 - b. Bill has an opinion as to whether Sue is here
 - c. Bill doesn't think that Sue is here.

- d. If Bill thinks that Sue is here, he will come.
- e. Perhaps Bill thinks that Sue is here.
- f. Does Bill think that Sue is here?

Again quoting from Gajewski (2005):

There are certain environments linguists use to diagnose the presence of a presupposition. The most common are the antecedents of conditionals, yes/no questions, and epistemic modals. [...] If *think* introduces the presupposition that its subject is opinionated about the truth or falsity of its complement, then we expect each of the sentences to imply that Bill has an opinion as to whether Sue is here. This does not seem to be the case Gajewski (2005:p.69)

In response to this difference, that is not predicted by the presuppositional approach, Gajewski (2007) postulates that the excluded middle is a soft presupposition in the sense discussed above. In other words, (54b) would not project out of embeddings like (54d)-(54f) because it can be suspended. I argue, however, that the suspension of soft presuppositions and the non-projection behavior of the excluded middle are different. The intuition is the following: consider (55a) and (56a): in an out of the blue context (55a) appears to give rise to the inference in (55b), unless we explicitly suspend it like in (55c) or by making clear that the speaker is ignorant about (55b). On the other hand, (56a) appears neutral with respect to the inference in (56b).

- (55)
 - a. If Mary stopped showing up late for class, Bill must be happy.
 - b. Mary used to show up late for class.
 - c. I don't know if Mary used to show up late for class, but If she stopped, Bill must be happy.
- (56)
 - a. If Mary thinks that Bill should be hired, she will say so at the next faculty meeting.
 - b. Mary has an opinion as to whether Bill should be hired.
 - c. I don't know whether Mary has an opinion, but If she thinks that Bill should be hired, she will say so at the next faculty meeting.

In other words, one can understand (56a) and not draw the inference in (56b), without the need for clear contextual information that the inference should be suspended like in (56c).¹⁵

In sum, the suspension of soft presuppositions requires explicit information in the context that the speaker is ignorant about the presupposition, while this doesn't appear to be the case for the excluded middle inference; hence, if the excluded middle is a presupposition, it is a strange one: it does not project as a presupposition and its non-projection appears to be a different phenomenon from the suspension of suspendable presuppositions.

2.3.3 Summary

We saw that Gajewski's (2007) proposal can account for the conventionality of neg-raising inferences, the projection through negation, the licensing of strict-NPIs, the inferences in the scope of negative quantifiers and negated universals and the partially cyclic behavior of stacked neg-raising predicates. Furthermore, by connecting to Abusch's (2010) account of soft triggers, it can also explain why they appear to be context dependent. However, we also saw that it has problems explaining the differences between soft triggers and neg-raising predicates in embeddings other than negation. Furthermore adopting Abusch's (2010) account brings in some empirical issues and extra assumptions about pragmatic principles and the semantics-pragmatic interface. In the next section, I propose a scalar implicature-based account of neg-raising in-

¹⁵Gajewski (2005) discusses another characteristics that appear to distinguish neg-raising inferences from presuppositions. The observation is that if they behaved as regular presuppositions, we would expect to find (57) hard to judge if we know that Mary has no opinion, but, as Gajewski (2005:p.69) says, "most people [...] have no problem judging this sentence false in such a scenario".

(57) Mary thinks that John is in town.

It is fair to say, however, that while the case of judging (58) seems clearly different from (57), as argued by von Stechow (2004) our judgements might not be reliable in the case of presupposition failure.

(58) The present King of France is bald.

Furthermore, I am not sure we would not simply judge (59) as false, in a context in which we know that John never showed up late for class.

(59) John stopped showing up late for class.

ferences, which like Gajewski's (2007) localizes the source of neg-raising in a set of lexical alternatives. However, it does not require non-standard assumptions about the semantics and pragmatics interface in that it is only based on an independently motivated theory of scalar implicatures. Furthermore, it straightforwardly predicts the differences between neg-raising predicates and soft triggers.

2.4 A scalar implicature-based approach

From the data discussed above, the generalization appears to be as follows: when neg-raising predicates and soft triggers are embedded under negation, the inferences associated with them arise systematically. For instance (60a) and (61a) are typically read as implying (60b) and (61b), respectively.

- (60) a. John didn't stop showing up late for class.
b. John used to show up late for class.
- (61) a. John doesn't think that Fred left.
b. John thinks that Fred didn't leave.

In the presupposition approach, (61b) arises from (61a) and the excluded-middle inference in (62), so in turn we could assume that (61a) gives rise systematically to (62).

- (62) John has an opinion as to whether Fred left.

However, while a soft presupposition like (60b) is also systematically drawn in the case of other embeddings, like the antecedents of conditionals, the corresponding inference in (62) is not. For instance, in the antecedent of a conditional like (63a), the inference in (63b) is systematic unless explicitly suspended, but the corresponding (64b) isn't there when we utter (64a).

- (63) a. If John stopped showing up late for class, Bill will be happy.
b. John used to show up late for class.

- (64) a. If John thinks that Fred left, he will be upset.
 b. John has an opinion as to whether Fred left.

Notice that scalar implicatures exhibit the very same pattern. For instance, consider the scalar implicature coming from a scalar term like *every*: first, under negation, scalar implicatures like (66b) from (66a) are intuitively robust.¹⁶

- (66) a. Not every student came.
 b. Some student came.

As discussed in CHAPTER 1, the inference from (66a) to (66b) can be accounted for as a scalar implicature, by postulating that *every* and *some* are alternatives to each other. As Chemla (2008) observes, we can also describe the inference in (65b) as behaving like a presupposition with respect to negation. In other words, one could describe the inference in (66b) as projecting through negation, as both (66a) and (67) give rise to the inference in (66b), the former as an entailment, the latter as a scalar implicature.

- (67) Every student came.

Given this perspective, one might wonder whether the inference in (66c) can “project” out of other embeddings such as the antecedent of a conditional, in parallel to what presuppositions do. In other words, one might wonder whether (68a) can lead to the inference in (68b).

- (68) a. If every student came, the party was a success
 b. Some student came

¹⁶Chemla (2009c) calls scalar implicatures coming from strong scalar terms in downward entailing contexts, like the one in (66b), “negative implicatures”. Chierchia (2004) calls them “indirect scalar implicatures” and claims that they are weaker than regular ones. I disagree with the intuition for the case of negation: I think (66b) is an inference of (66a) as robustly as (65b) is an inference of (65a).

- (65) a. Some of the students came.
 b. Not every student came.

In fact, (68b) is not predicted to be an inference of (68a) by standard theories of scalar implicatures and, indeed, there is a difference between the pair (63a) and (63b) and (68a) and (68b): assuming that we can infer (68b) from (68a) sometimes we certainly do not need the explicit suspension like in (69) in order not to draw it.

(69) I don't know whether any of the students came, but if everyone did, the party was a success.

From the data above, It appears that the behavior of neg-raising inferences in embeddings resembles scalar implicatures more than soft presuppositions. In the following, I show how we can derive this pattern: scalar implicatures and neg-raising inferences are drawn systematically when (strong) scalar terms and neg-raising predicates are embedded under negation, but much less, if at all, in other embeddings, like the antecedent of conditionals.

2.4.1 The excluded middle as an alternative

I adopt the theory of scalar implicatures as entailments of exhaustified sentences described in CHAPTER 1 (Fox 2007, Chierchia et al. To appear, Magri 2010b among others). The only addition specific to neg-raising has to do with the alternatives that I assume for neg-raising predicates: the proposal is that they have the excluded middle proposition as their alternative. The semantics of a neg-raising predicate P is non-presuppositional and it is given schematically in (70), while its alternatives are in (71).

$$(70) \quad \llbracket P \rrbracket = \lambda p \lambda x. P(p)(x)$$

$$(71) \quad \text{Alt}(P) = \left\{ \begin{array}{l} \lambda p \lambda x. P(p)(x) \\ \lambda p \lambda x. [P(p)(x) \vee P(\neg p)(x)] \end{array} \right\}$$

Given the definition of alternatives' growth in CHAPTER 1, a sentence like (72a) winds up having the alternatives in (72c).

- (72) a. John believes that Bill left
 b. **believe_j**(p)
 c. $\text{Alt}(\mathbf{believe}_j(p)) = \left\{ \begin{array}{l} \mathbf{believe}_j(p) \\ \mathbf{believe}_j(p) \vee \mathbf{believe}_j(\neg p) \end{array} \right\}$

A question at this point is of course where these alternatives of neg-raising predicates come from. I don't offer more than Gajewski (2007) and Abusch (2010) in this respect: instead of stipulating that **believe**(p) has **believe**(¬p) as an alternative, as Gajewski (2007) does, I am encoding the excluded middle, that is [**believe**(p) ∨ **believe**(¬p)], directly as one of the alternatives. This might seem just a technical variant of Abusch-Gajewski's approach, but as we will see in the next section, it now becomes possible to obtain neg-raising inferences via the alternatives above and just a regular theory of scalar implicatures.

2.5 Predictions

2.5.1 The basic case and negation

In the unembedded case, exhaustification is vacuous as the excluded middle alternative is entailed by the assertion. For instance, in the case of a neg-raising predicate like *believe* in (73a), if John believes that it is raining, then he has an opinion as to whether it is raining, so none of the alternatives in (73c) is excludable.

- (73) a. John believes that it is raining.
 b. **believe_j**(p)
 c. $\text{Alt}(\mathbf{believe}_j(p)) = \left\{ \begin{array}{l} \mathbf{believe}_j p \\ \mathbf{believe}_j p \vee \mathbf{believe}_j \neg p \end{array} \right\}$

However, when a sentence like (73a) is embedded under negation as in (74a), we predict the excluded middle to project out as if it was a presupposition: the alternative of (74a), schematized in (74b), becomes (75).

(74) a. John doesn't believe that it is raining.

b. $\neg \mathbf{believe}_j p$

$$(75) \quad \mathcal{Alt}(\neg \mathbf{believe}_j p) = \left\{ \begin{array}{l} \neg \mathbf{believe}_j p \\ \neg [\mathbf{believe}_j p \vee \mathbf{believe}_j \neg p] \end{array} \right\}$$

The negation of the excluded middle proposition is not entailed by (74b), hence when we exhaustify we wind up negating the negation of the excluded middle, thus obtaining the excluded middle again.

$$(76) \quad \llbracket \text{EXH} \rrbracket (\neg \mathbf{believe}_j p) = \neg \mathbf{believe}_j p \wedge \neg \neg [\mathbf{believe}_j p \vee \mathbf{believe}_j \neg p] = \\ \neg \mathbf{believe}_j p \wedge [\mathbf{believe}_j p \vee \mathbf{believe}_j \neg p]$$

As we know from above, (76) entails (77), hence we derive the neg-raising inference. Indeed, the claim that John has an opinion about p together with the assertion that it's not true that John believes that p allows us to conclude that he believes that not- p .

(77) $\mathbf{believe}_j \neg p$

2.5.2 Other embeddings and non-projection

2.5.2.1 Non projection

As we just saw, in the case of negation, exhaustifying a sentence like (78a) gives rise to the excluded middle inference in (78b), from which we can conclude the neg-raising inference in (78c).

(78) a. John doesn't think that Fred left

b. John has an opinion as to whether Fred left.

c. John thinks that Fred didn't leave.

What about the case of other embeddings? It is easy to show that the present proposal does not predict that neg-raising inferences should project out of embeddings in the same way as presuppositions. In other words, we make the same prediction for *think* and *every* in cases like (79a)-(79b) and (80a)-(80b): exhaustification of these cases does not give rise to the inferences in (79d) and (80d), respectively.

- (79) a. If John thinks that Fred left, he will be upset
b. Perhaps John thinks that Fred left
c. Does John think that Fred left?
d. \nrightarrow John has an opinion as to whether Fred left
- (80) a. If Frank met every student, he will come to our department.
b. Perhaps Frank met every student.
c. Did Frank meet every student?
d. \nrightarrow Frank met some student

For instance in the case of (79b), schematized in (81a), the alternatives that we have are in (81b). It is easy to see that none of the alternatives is excludable, thus no inference is predicted from exhaustification in this case.

- (81) a. $\Diamond[\mathbf{think}_j(p)]$
b. $Alt(\Diamond[\mathbf{think}_j(p)]) = \left\{ \begin{array}{l} \Diamond[\mathbf{think}_j(p)] \\ \Diamond[\mathbf{think}_j(p) \vee \mathbf{think}_j(\neg p)] \end{array} \right\}$

More in general, when a neg raising predicate P is embedded under some upward entailing operator O_{ue} , $EXH(O_{ue}[P])$ is always vacuous. When a predicate P is embedded under some non-upward entailing operator O_{non-ue} , instead, $EXH(O_{non-ue}[P])$, gives rise to the negation of the excludable alternatives of $O_{non-ue}[P]$. These inferences are different from the projection of the excluded middle predicted by the presuppositional approach, hence, in principle, if one could argue for their existence, one would have a strong argument in favor of the

present approach. As I show in the next section, however, the task is not easy.

2.5.2.2 Novel inferences

Consider the case of the antecedent of conditionals as in (82a), schematized as in (82b), where I adopt for concreteness a strict conditional semantics for conditionals (von Fintel 1997; see also CHAPTER 5). The alternatives wind up being (83a) and the exhaustification of (82a) with respect to such alternatives is in (83b).

- (82) a. If Mary believes that it will rain, she will take an umbrella
 b. $\Box[\mathbf{believe}(p) \rightarrow q]$
- (83) a. $\text{Alt} = \left\{ \begin{array}{l} \Box[\mathbf{believe}(p) \rightarrow q] \\ \Box[(\mathbf{believe}(p) \vee \mathbf{believe}(\neg p)) \rightarrow q] \end{array} \right\}$
 b. $\llbracket \text{EXH} \rrbracket (\Box[\mathbf{believe}(p) \rightarrow q]) =$
 $\Box[\mathbf{believe}(p) \rightarrow q] \wedge \neg \Box[(\mathbf{believe}(p) \vee \mathbf{believe}(\neg p)) \rightarrow q] =$
 $\Box[\mathbf{believe}(p) \rightarrow q] \wedge \Diamond[(\mathbf{believe}(p) \vee \mathbf{believe}(\neg p)) \wedge \neg q]$

(83b) claims that it's possible that Mary has an opinion as to whether it is raining and that she doesn't take an umbrella. Together with the first conjunct that asserts that if she believes that it is raining she will take an umbrella, the whole conjunction is equivalent to (84): if she believes that it is raining, she will take an umbrella and it is possible that she believes that it is not raining and she won't take an umbrella.

- (84) $\Box[\mathbf{believe}(p) \rightarrow q] \wedge \Diamond[\mathbf{believe}(\neg p) \wedge \neg q]$

In this case, however, it is not easy to argue for this inference, because it is entailed by the so-called “conditional perfection” inference, which conditionals have independently from the presence of neg-raising predicates.¹⁷ Let us turn, then, to another non-UE environment like the

¹⁷In this case the inference is that if it's not the case that Mary believes that it's raining, then she will not take the umbrella. This entails that if Mary believes that it's not raining then she will not take the umbrella. I come back to this in Appendix A.

restrictor of a universal quantifier, as in (85a). In this case, exhaustification gives rise to the result in (85b) as shown in (86b).

- (85) a. Every student who believes that she was accepted will come to the party.
b. Some student who believes that she wasn't accepted will not come to the party.

- (86) a. $\forall x[\text{believe}_x p \rightarrow Qx]$
b. $\llbracket \text{EXH} \rrbracket (\forall x[\text{believe}_x p \rightarrow Qx]) =$
 $(\forall x[\text{believe}_x p \rightarrow Qx]) \wedge \neg \forall x[(\text{believe}_x p \vee \text{believe}_x \neg p) \rightarrow Qx] =$
 $(\forall x[\text{believe}_x p \rightarrow Qx]) \wedge \exists x[(\text{believe}_x p \vee \text{believe}_x \neg p) \wedge \neg Qx]$

(86b) claims that every student who believes that she was accepted will come to the party and there is a student who either believes that she was accepted or believes that she wasn't and won't come to the party. The two conjuncts are equivalent to (87): every student who believes that she was accepted, will come to the party and there is a student who believes that she wasn't and won't come to the party.

- (87) $\forall x[\text{believe}_x p \rightarrow Qx] \wedge \exists x[\text{believe}_x \neg p \wedge \neg Qx]$

Given that the presuppositional account does not predict this inference, if we can argue for its existence we would have an argument for the present proposal.¹⁸

An argument for the inference above can be constructed on the basis of the so-called “Hurford’s constraint” outlined in CHAPTER 1. Chierchia et al. (To appear) use Hurford’s constraint as a diagnostic for scalar implicatures, so we can use it here to test the status of the inference above. For instance, the present proposal predicts that from (89a) we can have the inference in

¹⁸To see that the presuppositional account does not predict it, notice that what we can conclude from (88a) depends on our assumptions about the projection of presuppositions from the restrictors of universal quantifiers. Suppose, for the sake of the argument, that we assume a theory that predicts universal projection from the restrictor of universal quantifiers, what we can conclude from (88a) is (88b).

- (88) a. Every student who believes that she was accepted will come to the party.
b. Every student has an opinion on the matter.

(89b)

- (89) a. Every student who thinks I am right will support me.
b. Some student who think that I am not right will not support me.

We can then construct the disjunction in (90) to check whether (89b) is an inference from (89a). Notice that given the downward entailingness of the restrictor of *every* the second disjunct in (90) entails the first one, unless the first one is analyzed as in (91). (91), given the present proposal, gives rise to the inference in (89b), which disrupts the entailment relation.

(90) Either every student who thinks I am right will support me or every student who has an opinion on the matter (at all) will.

(91) EXH[every student who thinks that I am right will support me]

To the extent that (90) is felicitous we have an argument for the inference in (87). The same argument can be reproduced for the inference from (96a) to (96b), given the disjunction in (97). (cf. section 2.6.3, for the predictions relative to neg-raising predicates embedded under negative quantifiers).¹⁹

¹⁹Notice that this argument is undermined by felicitous disjunctions with no neg-raising predicate like (92), in which the second disjunct entails the first.

(92) We will either test everyone who smokes Marlboro or we will test everyone who smokes (at all).

If (92) is felicitous, there must be another inference disrupting the entailment relation between disjuncts. Katzir (2007) argues that the restrictor of a universal has its syntactic simplification as alternatives. So in this case the alternative of (93a) would be (93b). Exhaustification would give then rise to the inference in (94), which, in turn, would disrupt the entailment relation between the disjuncts of (92).

- (93) a. We wil test everyone who smokes Marlboro.
b. We will test everyone who smokes.

(94) \neg [we will test everyone who smokes]

This alternative explanation of the felicity of this type of disjunction is not available for cases in which the entailing disjunct is more complex than the entailed one, like in (95). In this case it is not straightforward to see what alternative obtained by syntactically simplify the first disjunct could disrupt the entailment relation between the second disjunct and the first one.

- (96) a. No student who thinks that I am wrong will support me.
b. Some student who thinks that I am right will support me.
- (97) Either no student who thinks that I am wrong will support me or no student who has an opinion on the matter will.

2.5.2.3 Summary

I proposed that neg-raising predicates have their corresponding excluded middle propositions as alternatives and that neg-raising inferences arise as a scalar implicature via exhaustification of sentences containing such predicates. As we saw, the differences between neg-raising inferences and (soft) presuppositions are accounted for straightforwardly in the present approach. Notice that strictly speaking explaining the difference depends also on the account of soft presuppositions that we assume. This is because once we have an account of neg-raising in terms of scalar implicatures we do not have to connect neg-raising and soft presuppositions anymore. In particular, if we have an account of soft presuppositions as real presuppositions, like the one proposed in Fox 2012b, explaining the difference with neg-raising inferences becomes extremely easy: one can simply assume that any difference between the two comes from the fact that they are different things. On the other hand, if you have an account of (soft) presuppositions as scalar implicatures like the one I propose in CHAPTER 3 and 4 or Chemla 2009a, in preparation, then, like Gajewski (2007), you face the challenge of accounting for the difference between neg-raising inferences and soft presuppositions. In CHAPTER 3, Appendix A, I show that, unlike the presuppositional approach, the scalar implicature approach allows us to account for the differences between soft presuppositions and neg-raising inferences, while treating them both as scalar implicatures. In CHAPTER 4, Appendix B, I compare the scalar-implicature based theory of soft presuppositions I propose in CHAPTER 3 to the one in Fox 2012b.

Finally, notice that the present proposal, like Gajewski's (2007), can account for the fact

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- (95) Either every student who wants to invite Philippe will come to the meeting or every student who has a desire on the matter will come.

that neg-raising inferences are characteristics of certain predicates and not others. What distinguishes neg-raising and non-neg-raising predicates is their alternatives: the former has the excluded middle as an alternative but the latter do not.

2.6 Explaining what the presuppositional approach can explain

I turn now to the four aspects of the behavior of neg-raising predicates discussed in section 2.3.1, which are taken as motivations for the presuppositional approach, and I show how the present proposal can account for them too.

2.6.1 Suspension of neg-raising inferences

The context dependence of neg-raising predicates can be accounted for in the presuppositional account by a mechanism of local accommodation or cancellation of the presupposition. How can we account for it in the present proposal? In CHAPTER 1, I discussed how the exhaustification-based theory can account for the context dependence of scalar implicatures. I show now that we can adopt the same mechanism for the case of neg-raising inferences.

To illustrate, let us start from the case, where the neg-raising inference is not suspended. I argue that in cases (98a), the most natural question under discussion is (99a).

- (98) a. Bill doesn't think that Fred left.
- b. Bill thinks that Fred didn't leave.

- (99) a. What does Bill think about whether Fred left?

(99) in turn gives rise to the partition in (101b) (or refinements thereof), where the cells are worlds in which Bill thinks that Fred left, the ones in which Bill thinks that Fred didn't leave and the ones in which Bill has no opinion on the matter.

$$(100) \quad Q = \left\{ \begin{array}{l} c_1 = \mathbf{think}_b p \\ c_2 = \mathbf{think}_b \neg p \\ c_3 = \neg[\mathbf{think}_b(p) \vee \mathbf{think}_b(\neg p)] \end{array} \right\}$$

Recall that we are assuming a notion of relevance such that a proposition is relevant if and only if it is a cell or a union of cells in the (partition of) the question under discussion. The alternatives of (98a) as schematized in (101a) are represented in (101b).

$$(101) \quad \begin{array}{ll} \text{a.} & \neg \mathbf{think}_b(p) \\ \text{b.} & \mathcal{Alt} = \left\{ \begin{array}{l} \neg \mathbf{think}_b(p) \\ \neg[\mathbf{think}_b(p) \vee \mathbf{think}_b(\neg p)] \end{array} \right\} \end{array}$$

We can now see that they are all relevant: they are either a cell or a union of cells of (100).²⁰ Hence, when we exhaustify as in (102), we obtain the inference in (121d), in the way indicated above.

$$(102) \quad \text{EXH}[\text{not}[\text{Bil thinks}_{[+\sigma]} \text{ that Fred left}]]$$

Let us consider now the case of suspension in (103), repeated from above.

$$(103) \quad \text{John DOESN'T think that it is raining. He isn't sure.}$$

The focus on the auxiliary suggests that the question under discussion is (104). (104) is a polar question, which creates the partition in (105). Given Q, among the alternatives of (103) in (107) only the one corresponding to the assertion, $\neg \mathbf{think}_j(p)$, is relevant.^{21,22}

²⁰ $\neg \mathbf{think}_b(p) = c_2 \cup c_3$ and $\neg[\mathbf{think}_b(p) \vee \mathbf{think}_b(\neg p)] = c_3$.

²¹ $\neg[\mathbf{think}_j(p) \vee \mathbf{think}_j(\neg p)]$ is irrelevant because it distinguishes within the c_2 .

²² When we have an explicit question-answer like in (104a)-(104b), we can understand (104b) as implicating that John thinks that it's not raining. In the case in which we draw the neg-raising inference we are accommodating a different question, namely (152).

$$(104) \quad \begin{array}{ll} \text{a.} & \text{Does John think that it is raining?} \\ \text{b.} & \text{John doesn't think that it is raining.} \end{array}$$

(105) Does John think that it is raining?

$$(106) \quad Q = \left\{ \begin{array}{l} c_1 = \mathbf{think}_j p \\ c_2 = \neg \mathbf{think}_j p \end{array} \right\}$$

$$(107) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \neg \mathbf{think}_j(p) \\ \neg[\mathbf{think}_j(p) \vee \mathbf{think}_j(\neg p)] \end{array} \right\}$$

In this case, then, no alternative other than the assertion is relevant thus we predict the suspension of the neg-raising inference in (103). This can account for the observation by Gajewski (2005) that stress on the negation suspends the neg-raising inference, as shown by (108a) versus (108b), repeated from above.

- (108) a. John doesn't think that Fred left. #He isn't sure.
b. John DOESN'T think that Fred left. He isn't sure.

Notice that indeed the same pattern arises with other scalar terms like *some* in (109a) and (109b).

- (109) a. John didn't correct some of the papers, #he corrected them all.
b. John DIDN'T correct some of the papers, he corrected them all.

Summing up, the suspension of neg-raising inferences is accounted for by simply adopting the mechanism for suspension of scalar implicature. Furthermore, this accounts for the fact that stress on negation suspends neg-raising inferences.²³

²³As Gajewski (2005) observes we can also suspend neg-raising inferences via stress on the predicate.

- (110) John doesn't THINK that it is raining, he is not sure.

Scalar implicatures seem to pattern again in the same way as neg-raising inferences here, as (111) shows.

- (111) John didn't correct ALL of the papers, he corrected none.

How do we account for the suspension of (110) and (111)? I argue that the focus on the predicate suggests that the question under discussion should be (112a) and the corresponding partition (112b): we are asking what is the relation is that John does not bear to the propositional complement.

2.6.2 Interaction with polarity

The present proposal predicts, like Gajewski's (2007), that negated neg-raising predicates create anti-additive environments, thus predicting the licensing of strong NPIs like *until* in sentences like (115).

(115) John didn't think that Bill would leave until tomorrow

In fact, the entailment in (116), for any neg-raising predicate *P*, propositional arguments *p*, *q* and individual *x*, is also predicted by the semantics proposed here.

(116) $\llbracket \text{EXH}[\text{not } P] \rrbracket(p)(x) \wedge \llbracket \text{EXH}[\text{not } P] \rrbracket(q)(x) \Rightarrow \llbracket \text{EXH}[\text{not } P] \rrbracket(p \vee q)(x)$

Let us go through this in brief: first, consider the meaning of a neg-raising predicate *P* to have the form in (117a) (see fn.2 and 13 above), with the alternatives in (117b), and that the exhaustification of (117a) with respect to the alternatives in (117b), brings about the neg-raising inference as in (117c).

(117) a. $\llbracket \text{not } P \rrbracket(p)(x) = \neg \Box p$
 b. $\text{Alt} = \left\{ \begin{array}{l} \neg \Box p \\ \neg [\Box p \vee \Box \neg p] \end{array} \right\}$
 c. $\llbracket \text{EXH}[\text{not } P] \rrbracket(p)(x) = \neg \Box p \wedge \neg \neg [\Box p \vee \Box \neg p] = \Box \neg(p)$

(112) a. What is the *R* such that John doesn't bear *R* with respect to whether it is raining?
 b. $\{\neg \text{think}_j p, \neg \text{think}_j \neg p, \neg \text{think}_j p \wedge \neg \text{think}_j \neg p, \neg \text{hope}_j p, \dots\}$

In this case, the alternative that John does not have an opinion as to whether it is raining is relevant. Therefore, if the sentence is exhaustified globally, it would lead to the neg-raising inference in (113), which is in contradiction with the second sentence in (111). We are then allowed to exhaustify locally and suspend the inference.

(113) $\neg \text{EXH}[\text{John thinks that it is raining}], \text{ he is not sure.}$

The same *mutatis mutandis* applies to the case of *all*. Notice that it is not clear that focus on a soft trigger like *discover* obtain the same effect of suspension. Beaver (2004) argues, indeed, that the intonational pattern in (114) favors the projection of the soft presupposition, rather than its suspension.

(114) John didn't DISCOVER that he was accepted, (?)he wasn't.

Analogously, the exhaustification of (118a) with respect to (118b) brings about the inference in (118c).

$$\begin{aligned}
 (118) \quad & \text{a. } \llbracket \text{not } P \rrbracket (p \vee q)(x) = \neg \Box(p \vee q) \\
 & \text{b. } \mathcal{Alt} = \left\{ \begin{array}{l} \neg \Box(p \vee q) \\ \neg [\Box(p \vee q) \vee \Box \neg(p \vee q)] \end{array} \right\} \\
 & \text{c. } \llbracket \text{EXH}[\text{not } P] \rrbracket (p \vee q)(x) = \neg \Box(p \vee q) \wedge \neg \neg [\Box(p \vee q) \vee \Box \neg(p \vee q)] = \Box \neg(p \vee q)
 \end{aligned}$$

It is easy to show, then, that (119a) and (119b) together entail (119c): if there are no worlds in which p is true and there are no worlds in which q is true, there are no worlds in which $p \vee q$ is true.

$$\begin{aligned}
 (119) \quad & \text{a. } \llbracket \text{EXH}[\text{not } P] \rrbracket (p)(x) = \Box \neg(p) \\
 & \text{b. } \llbracket \text{EXH}[\text{not } P] \rrbracket (q)(x) = \Box \neg(q) \\
 & \text{c. } \llbracket \text{EXH}[\text{not } P] \rrbracket (p \vee q)(x) = \Box \neg(p \vee q)
 \end{aligned}$$

Summing up, for arbitrary p, q the present semantics validates the inference in (116), thus predicting that negated neg-raising predicates create anti-additive contexts.²⁴

I turn now to negative quantifiers and negated universals and show that the inferences predicted by the present proposal are the right ones and that the licensing of NPIs in such environments is also correctly predicted.

2.6.3 Negative quantifiers and negated universals

Turning to the case of negative quantifiers, recall that we want to account for the fact that (120a) gives rise the inference in (120b) and that strict NPIs are licensed in the scope of negative quantifiers as (121) shows.

$$(120) \quad \text{a. } \text{No student thinks that Mary passed.}$$

²⁴Recently, Gajewski (2009) himself and Chierchia (to appear) have argued that anti-additivity is actually neither sufficient nor necessary for the licensing of strict NPIs. I come back to this in Appendix C, with a discussion of a problem for that approach in relation to presuppositional neg-raising predicates.

- b. Every student thinks that Mary didn't pass.

(121) No student thought that Mary would leave until tomorrow.

Furthermore, as Homer (2012a) discusses, we also want to account for the inference from a negated universal quantifier like (122a) to (122b).

- (122) a. Not every student think that Mary passed
- b. Some student thinks that Mary didn't pass

As we saw above, the presuppositional approach can account for these inferences, assuming the projection behavior of presuppositions across negative quantifiers and negated universals. Let me show now that the present account also has no problem accounting for these facts, if we assume that a sentence with *no* like (123a) has the corresponding sentence with *not every* in (123b) as an alternative.

- (123) a. No student came.
- b. Not every student came.

This assumption is motivated independently on the following grounds: first, notice that it is generally assumed that sentences with negative quantifiers like (124a) and negated universals like (124b) are alternatives of one another (Horn (1972), Levinson (2000)). Indeed as seen above, this can predict the inference from (124a) to (124c) as the negation of the stronger alternative in (124b).

- (124) a. Not every student came.
- b. No student came.
- c. Some student came.

Second, there are various independent arguments for decomposing negative quantifiers into negation plus an indefinite (see Sauerland 2000, Penka 2007, Iatridou and Sichel 2008 among

many others). Assuming the decomposition of *no* as *not some*, given any standard definition of how alternatives grow (Sauerland 2004; cf. CHAPTER 1) and the assumption that *every* and *some* are scale-mates, we straightforwardly predict that a sentence with *no* (=not some) should have the corresponding sentence with *not every* as an alternative.

Given this assumption, a sentence like (125a) will have (125b) among its alternatives and so we obtain the universal neg-raising inference in (125c) as shown by the derivation in (126).

- (125) a. No student thinks that Mary passed.
b. Not every student thinks that Mary passed.
c. Every student thinks that Mary didn't pass.

- (126) a. $\neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)]$

$$b. \text{Alt} = \left\{ \begin{array}{l} \neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)] \\ \neg\exists x[\mathbf{stud}(x) \wedge (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] \\ \neg\forall x[\mathbf{stud}(x) \rightarrow \mathbf{think}_m(p)] \\ \neg\forall x[\mathbf{stud}(x) \rightarrow (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] \end{array} \right\}$$

$$c. \text{Excl} = \left\{ \begin{array}{l} \neg\exists x[\mathbf{stud}(x) \wedge (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] \\ \neg\forall x[\mathbf{stud}(x) \rightarrow (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] \end{array} \right\}$$

$$\begin{aligned} d. \llbracket \text{EXH} \rrbracket (\neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)]) &= \\ \neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)] \wedge \forall x[\mathbf{stud}(x) \rightarrow (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] &= \\ \neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)] \wedge \forall x[\mathbf{stud}(x) \rightarrow \mathbf{think}_m(\neg p)] & \end{aligned}$$

In sum, the present account correctly predicts a universal neg-raising inference in the scope of negative quantifiers like *no*. I argue for the existence of this inference in the case of scalar implicatures in general; for instance, that (127b) can be an inference of (127a) (see CHAPTER 3 and 6 for discussion).

- (127) a. None of these ten professors failed all of their students.

- b. \leadsto All of these ten professors failed some of their students.

As for the licensing of strict NPIs, notice that we also predict that neg-raising predicates in the scope of negative quantifiers create an anti-additive environment. In fact, if no one thinks that p and no one thinks that q the entailment that no one thinks that p or q is predicted. If every person's belief worlds are worlds in which p is not true and every person's belief worlds are worlds in which q is not true than every person's belief worlds are worlds in which p or q is not true. This can account for the licensing of strict-NPIs in sentences like (128).

(128) No student thought that Bill would leave until tomorrow

Turning now to negated universals, it is easy to see that also in this case the present proposal makes the correct prediction. In other words, it predicts (129b) to be an inference of (129a), as shown by the derivation in (130).

- (129) a. Not every students wants to help me (Homer 2012a)
 b. There is some student who wants not to help me

- (130) a. $\neg\forall x[\text{stud}(x) \rightarrow \text{want}_m(p)]$

$$\text{b. } \mathcal{Alt} = \left\{ \begin{array}{l} \neg\forall x[\text{stud}(x) \rightarrow \text{want}_m(p)] \\ \neg\forall x[\text{stud}(x) \rightarrow (\text{want}_m(p) \vee \text{want}_m(\neg p))] \\ \neg\exists x[\text{stud}(x) \wedge \text{want}_m(p)] \\ \neg\exists x[\text{stud}(x) \wedge (\text{want}_m(p) \vee \text{want}_m(\neg p))] \end{array} \right\}$$

$$\text{c. } \mathcal{Excl} = \left\{ \begin{array}{l} \neg\exists x[\text{stud}(x) \wedge \text{want}_m(p)] \\ \neg\exists x[\text{stud}(x) \wedge (\text{want}_m(p) \vee \text{want}_m(\neg p))] \\ \neg\forall x[\text{stud}(x) \rightarrow (\text{want}_m(p) \vee \text{want}_m(\neg p))] \end{array} \right\}$$

- d. $\llbracket \text{EXH} \rrbracket (\neg\forall x[\text{stud}(x) \rightarrow \text{want}_m(p)]) =$
 $\neg\forall x[\text{stud}(x) \rightarrow \text{want}_m(p)] \wedge \exists x[\text{stud}(x) \wedge \text{want}_m(p)] \wedge \forall x[\text{stud}(x) \rightarrow (\text{want}_m(p) \vee \text{want}_m(\neg p))] = \neg\forall x[\text{stud}(x) \rightarrow \text{want}_m(p)] \wedge \exists x[\text{stud}(x) \wedge \text{want}_m(p)] \wedge$

$$\exists x[\text{stud}(x) \wedge \text{want}_m(\neg p)]$$

Summing up, we do not need the presuppositional approach to account for the universal inference of neg-raising predicates embedded in the scope of negative quantifiers and the wide scope existential readings of negated universals, nor do we need it to account for the licensing of strict-NPIs in such environments. Let me now turn to the last putative presuppositional behavior of neg-raising predicates, that is their behavior when stacked one into another.

2.6.4 Partial cyclicity

As discussed above, a negated neg-raising belief predicate embedding a neg-raising desire-one like in (131a) allows a reading as if negation was taking scope at the lowest level like in (131b), while a desire-predicate embedding a belief-one like (132a) does not.

- (131) a. I don't believe Bill wanted Harry to die. $\sim\rightarrow$
b. I believe Bill wanted Harry not to die.
- (132) a. I don't want Bill to believe Harry died. \nrightarrow
b. I want Bill to believe Harry didn't die.

Furthermore, strict-NPIs are licensed in sentences like (131a) but not in (132b) as shown by (133a) and (133b), respectively.

- (133) a. I don't believe John wanted Harry to die until tomorrow. (Gajewski 2007)
b. *I don't want John to believe Harry died until yesterday.

As we saw, the presuppositional approach can explain this pattern quite elegantly. I show that the present proposal can account for it, given a condition that regulates the interaction between presuppositions and exhaustification. Let us first go through what happens if we exhaustify (132a) or (131a).

2.6.4.1 Symmetric predictions

As it stands, the present system overgenerates, in that it predicts that both the negation of *believe(want)* and that of *want(believe)* should lead to the reading as if negation was taking the lowest scope below both predicates. To illustrate, consider the sentence in (134a), schematized in (134b) and with the alternatives in (134c).

- (134) a. Mary doesn't believe that John wants Fred to leave
- b. $\llbracket \text{EXH} \rrbracket [\neg [\text{bel}_m [\text{want}_j (p)]]]$
- c. $\left\{ \begin{array}{l} \neg [\text{bel}_m [\text{want}_j (p)]] \\ \neg [\text{bel}_m [\text{want}_j (p) \vee \text{want}_j (\neg p)]] \\ \neg [\text{bel}_m [\text{want}_j (p)] \vee \text{bel}_m [\neg [\text{want}_j (p)]]] \\ \neg [\text{bel}_m [\text{want}_j (p) \vee \text{want}_j (\neg p)] \vee \text{bel}_m [\neg [\text{want}_j (p) \vee \text{want}_j (\neg p)]]] \end{array} \right\}$

Once we exhaustify and negate all the alternatives that are not entailed by the assertion we obtain the conjunction of (135a), (135b), and (135c).

- (135) a. $\neg \text{believe}_m (\text{want}_j (p))$
- b. $\text{believe}_m (\text{want}_j (p)) \vee \text{believe}_m \neg (\text{want}_j (p))$
- c. $\text{believe}_m (\text{want}_j (p) \vee \text{want}_j (\neg p))$

It is easy to see that from (135a) and (135b) we can conclude (136a) and from (136a) and (135c) we can infer that (136b).

- (136) a. $\text{believe}_m \neg (\text{want}_j (p))$
- b. $\text{believe}_m (\text{want}_j (\neg p))$

So we rightly predict that (134a) can lead to the inference in (137).

- (137) Mary believes that John wants that Fred didn't leave

The predictions, however, are the same also for *want* embedding *believe*, as they only depend on the combination of alternatives. We have of course various ways to suspend this inference (non-activation of alternatives and local exhaustification) but the question is why the inference appears to be always suspended, in a way that differs from the one coming from *believe(want)*. In response to this issue, I propose that there is a condition on EXH, which requires that EXH should not tinker with the presupposition of its prejacent. As I show below, this blocks exhaustification in the case of *want* embedding *believe*, but not in the case of *believe* embedding *want*.

2.6.4.2 A condition on EXH

The idea in informal terms is that the exhaustification of a sentence should leave untouched the presupposition of its prejacent. As I show below, if we were to exhaustify a sentence like (138) we would end up strengthening its presuppositions and thus we cannot do it.

(138) I don't want Bill to believe Harry died.

Before formulating the condition, let us make some explicit assumptions about what happens when EXH applies to a presuppositional prejacent. First, we need to adopt the notion of strawson-entailment, as defined in (139) (Gajewski 2011, von Stechow 1999).

(139) **Strawson entailment**

- a. For p, q of type t ,
 $p \subseteq_s q$ iff $p \rightarrow q$
- b. For f, g of type $\langle \sigma, \tau \rangle$,
 $f \subseteq_s g$ iff for all a of type σ such that $g(a)$ is defined then $f(a) \subseteq_s g(a)$

The notion of Strawson entailment allows us to look at entailment relations by ignoring presuppositions. We can, hence, define EXH as in (140).²⁵

- (140) a. $\llbracket \text{EXH} \rrbracket(\phi)(w) = \forall \psi \in \mathcal{E}xcl(\phi)[\neg \psi_w]$
 b. $\mathcal{E}xcl(\phi) = \{\psi \in \mathcal{A}lt(\phi) : \phi \not\leq_s \psi\}$

The presuppositions of an exhaustified sentence are, hence, going to be those of the prejacent and those of the negated alternatives. We can now formulate the condition in (141), which requires EXH to leave the presuppositions of its prejacent untouched. In other words, the exhaustivity operator should be just a “hole” in Karttunen’s (1973) sense and not add anything to the presuppositions of the prejacent. The condition is formulated as a presupposition of EXH as in (141) (to be revised in Appendix B, to accommodate cases not involving only neg-raising predicates).

- (141) EXH[ϕ] is defined only if $\pi(\phi) = \pi(\text{EXH}[\phi])$
 (where for any α , $\pi(\alpha)$ indicates the presuppositions of α)

I show now that (141) blocks exhaustification in the case of *want* embedding *believe*, but before that let us go through a semantics for *want* that I adopt.

A semantics for *want* I adopt the doubly-relative modal semantics of *want* proposed by von Fintel (1999), and defended further in Crnic 2011.²⁶ A sentence like *a wants p* roughly says that among α ’s doxastic alternatives, the most desirable to α are p -worlds. von Fintel (1999) formalizes this intuition with a modal semantics, relativized to two conversational backgrounds: the first is the modal base, that is the set of α ’s doxastic worlds, and the second is a set of propositions, representing α ’s desires and used to impose an ordering on the modal base. These two conversational backgrounds are obtained through the use of the two functions in (142a) and

²⁵We can define the notion of innocent exclusion on the basis of Strawson entailment. I just use the simpler notion here for the sake of presentation.

²⁶This is not essential and an analogous argument could be made with Heim’s (1992) non-monotonic semantics.

(142b).

- (142) a. $f(a, w) = \{w' \in W : w' \text{ is compatible with what } a \text{ believes in } w\}$
 b. $g(a, w) = \{p \subseteq W : p \text{ is (the content of) a desire of } a \text{ in } w\}$

We now define a strict partial ordering on $f(a, w)$ using the set of propositions $g(a, w)$, as in

(143): w' is better than w'' relative to P iff all propositions in P that hold in w'' also hold in w' and some that hold in w' do not hold in w'' .

- (143) for any set of propositions P , worlds w', w'' :
 $w' <_P w''$ iff $\forall p \in P : p(w'') \rightarrow p(w') \wedge \exists q \in P : p(w') \wedge \neg p(w'')$

Then we define a selection function $BEST_P$, which picks the worlds in the modal base that are best according to $<_P$

- (144) given a partial ordering $<_P$, $BEST_P$ selects the best P worlds in any set of worlds X :
 $\forall X \subseteq W : BEST_P(X) = \{w \in X : \neg \exists w' \in X : w' <_P w\}$

Finally, we can define the meaning of *want* as in (145).

- (145) $\llbracket \text{want} \rrbracket(f)(g)(p)(a) = \lambda w . \forall w' \in BEST_{g(a, w)}(f(a, w))[p(w')]$

The semantics above has to be refined, because as Heim (1992) and von Fintel (1999) notice, it has some unwanted consequence in relation to what the attitude holder believes. In particular, if a believes that p , it follows that a *wants* that p is automatically true (if all a 's belief worlds are p -worlds, then the most desirable worlds to a among them will also be). Analogously, if a believes that p is false, it follows automatically that a *wants* that p is false (if none of a 's belief worlds are p -worlds, then none of the most desirable to a among them are p -worlds). To avoid this problem, von Fintel (1999), following Heim (1992), postulates that the semantics above also has a presupposition that the attitude holder neither believes that the propositional

argument of *want* is true nor believes that it's false.²⁷

$$(147) \quad \llbracket \text{want} \rrbracket (f)(g)(p)(a) = \\ \lambda w : \emptyset \neq f(a, w) \cap p \neq f(a, w) . \forall w' \in \text{BEST}_{g(a, w)}(f(a, w))[p(w')]$$

Back to partial cyclicity Let us go back to the case of *want* embedding *believe* like in (148).

(148) Mary doesn't want John to believe that Fred left.

I am assuming that the meaning of (148) is (149a) with the presuppositions in (149b). I show now that if we were to exhaustify (149) we would strengthen the presuppositions in (149b).

$$(149) \quad \begin{aligned} \text{a.} \quad & \neg \forall w' \in \text{BEST}_{g(m, w)}(f(m, w))[\mathbf{bel}_{j, w'}(p)] \\ \text{b.} \quad & \exists w' \in f(m, w)[\mathbf{bel}_{j, w'}(p)] \wedge \exists w'' \in f(m, w)[\neg \mathbf{bel}_{j, w''}(p)] \end{aligned}$$

Let us simplify the notation and write (149b) as (150), where $\Diamond_m[p]$ indicates that *p* is possible according to Mary's beliefs.

$$(150) \quad \Diamond_m[\mathbf{bel}_j(p)] \wedge \Diamond_m[\neg \mathbf{bel}_j(p)]$$

Consider now what would happen if we were to exhaustify (148) as in (151) with respect to its alternatives in (152).

(151) EXH[Mary doesn't want John to believe that Fred left]

²⁷Notice that this has to be further refined to accommodate examples such as (146) from Heim (1992), where the attitude holder does not appear to have doubts about where he will be tonight.

(146) (John hired a baby-sitter) because he wants to go to the movies tonight.

Heim (1992:p.199) proposes that what (146) teaches us is that “when we assess someone's intention [...] we don't take into account all his beliefs, but just those that he has about matters unaffected by his own future actions”. In other words, in the semantic adopted here, we should not consider in $f(\alpha, w)$ the set of doxastically accessible worlds, but rather the set of worlds compatible with what α believes to be the case no matter how he or she chooses to act. For our purposes, this modification is immaterial, so I will just ignore it.

$$(152) \quad \left\{ \begin{array}{l} \neg[\mathbf{want}_m[\mathbf{bel}_j(p)]] \\ \neg[\mathbf{want}_m[\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p)]] \\ \neg[\mathbf{want}_m[\mathbf{bel}_j(p)] \vee \mathbf{want}_m[\neg[\mathbf{bel}_j(p)]]] \\ \neg[\mathbf{want}_m[\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p)] \vee \mathbf{want}_m[\neg[\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p)]]] \end{array} \right\}$$

The result of exhaustification is the conjunction of (153a), (153b), and (153c).

- (153) a. $\neg\mathbf{want}_m(\mathbf{bel}_j(p))$
 b. $\mathbf{want}_m(\mathbf{bel}_j(p)) \vee \mathbf{want}_m\neg(\mathbf{bel}_j(p))$
 c. $\mathbf{want}_m(\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p))$

As for the assertion part, in parallel to the case of *believe* embedding *want*, from (154a) and (154b) we could conclude (154c) and from (155a) and (155b) we could conclude (155c). In other words, we would obtain the reading equivalent to negation taking scope below both neg-raising predicates.

- (154) a. $\neg\mathbf{want}_m(\mathbf{bel}_j(p))$
 b. $\mathbf{want}_m(\mathbf{bel}_j(p)) \vee \mathbf{want}_m\neg(\mathbf{bel}_j(p))$
 c. $\mathbf{want}_m(\neg(\mathbf{bel}_j(p)))$
- (155) a. $\mathbf{want}_m(\neg\mathbf{bel}_j(p))$
 b. $\mathbf{want}_m(\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p))$
 c. $\mathbf{want}_m(\mathbf{bel}_j(\neg p))$

However, I show now that the presupposition of the exhaustified sentence is stronger than that of the prejacent, thus exhaustification is blocked by the condition in (141). To see this, let us go through the presupposition of each conjunct of the exhaustified assertion. The first conjunct in (153a) is simply the prejacent so its presupposition in (156a) is just that of the prejacent. The presupposition of the second conjunct in (153b) is the same as the one in (156a) as shown in

(156b).²⁸ Finally, that of the third conjunct (153c) is the one in (156c).

- (156) a. $\Diamond_m[\mathbf{bel}_j p] \wedge \Diamond_m[\neg \mathbf{bel}_j p]$
 b. $\Diamond_m[\mathbf{bel}_j p] \wedge \Diamond_m[\neg \mathbf{bel}_j p]$
 c. $\Diamond_m[\mathbf{bel}_j p \vee \mathbf{bel}_j \neg p] \wedge \Diamond_m[\neg[\mathbf{bel}_j p \vee \mathbf{bel}_j \neg p]]$

The presupposition of the exhaustified assertion would, hence, be (157a), that is the conjunction of the presuppositions in (156a), (156b) and (156c).

- (157) a. $\Diamond_m[\mathbf{bel}_j p] \wedge \Diamond_m[\neg[\mathbf{bel}_j p \vee \mathbf{bel}_j \neg p]]$
 b. $\Diamond_m[\mathbf{bel}_j p] \wedge \Diamond_m[\neg \mathbf{bel}_j p]$

It is easy to see that (157a) is stronger than the presupposition of the prejacent repeated in (157b), thus exhaustification is blocked by the condition in (141) above.

Notice that the case of unembedded *want* is not blocked by (141). To see this consider the exhaustification of a sentence like (158a), which gives rise to the meaning in (158b): the presuppositions is that in (159), which is identical to that of the prejacent.

- (158) a. EXH[John doesn't want that p]
 b. $\neg \mathbf{want}_j p \wedge \mathbf{want}_j p \vee \mathbf{want}_j \neg p =$
 $\mathbf{want}_j \neg p$

- (159) $\Diamond_j p \wedge \Diamond_j \neg p$

Furthermore, the case of *believe* embedding *want* like (164a) repeated from above is also allowed by (141) because *believe* is non-presuppositional, so we predict that EXH can apply and thus gives rise to the inference in (164b).

Notice that by blocking EXH in (160a) we not only predict that negation cannot take scope below *think*, but we also seem to incorrectly predict that it should not even take scope below

²⁸Notice that this is the case regardless of the assumptions about the projection of presuppositions in disjunctive sentences.

want. In other words, we do not predict the inference from (160a) to (160b)

- (160) a. John doesn't want that Mary think that p
 b. John wants that it's not true that Mary think that p

However, we have a way to predict the inference from (160a) to (160b), through the LF in (161). In fact, the most embedded EXH is vacuous, as *think* is the strongest among its alternatives, however it “eats” the alternatives of *think*. Hence, at the global level we are free to exhaustify again only over the alternatives of *want* in (162), thereby getting the reading that we want, as shown in (163). This reduces to the case of *want* not embedding other scalar terms above, which is allowed by (141).

$$(161) \quad \text{EXH}[\neg[\mathbf{wants}_j[\text{EXH}[\mathbf{think}_m(p)]]]]$$

$$(162) \quad \left\{ \begin{array}{l} \neg[\mathbf{want}_m[\mathbf{think}_m p]] \\ \neg[\mathbf{want}_m[\mathbf{think}_m p] \vee \mathbf{want}_m[\neg[\mathbf{think}_m p]]] \end{array} \right\}$$

$$(163) \quad \mathbf{want}_j \neg[\mathbf{think}_m p]$$

- (164) a. Mary doesn't believe that John wants that Fred left.
 b. Mary believes that John wants that Fred didn't leave.

In sum, given (141) we correctly predict that, contrary to (164a), (165a) cannot be exhaustified and thus cannot give rise to the inference in (165b). Also the last putative argument for the presuppositional status of neg-raising predicates can, hence, be accounted for in the scalar implicature-based proposal here.

- (165) a. I don't want Bill to believe Harry died \nrightarrow
 b. I want Bill to believe Harry didn't die.

2.7 Conclusion

I proposed a scalar implicatures-based approach to neg-raising inferences, which accounts for the conventionality and the context dependence of neg-raising inferences. The proposal presents three advantages over Gajewski's (2007) presuppositional account. First, it accounts for the non-presuppositional aspect of the behavior of neg-raising inferences, that is their projecting through negation but not through other embeddings. Second it predicts novel inferences when neg-raising predicates are embedded in non-upward entailing contexts that the presuppositional account does not predict. Third, it is based on an independently justified theory of scalar implicatures and it does not need to adopt the system by Abusch (2010), which, as discussed above, has conceptual and empirical problems. Furthermore, it can explain the suspension of neg-raising inferences, the interaction with the licensing of strict NPIs, the behavior of neg-raising predicates in the scope of negative quantifiers and negated universals and when they are stacked one into the other.

2.8 Appendix A: conditional perfection and neg-raising

As pointed out by Geis and Zwicky 1971, a conditional like (166a) can be read as implying (166c) (von Fintel 2001, Franke 2011 among others). From (166a) and (166b) we can conclude (166c).

- (166)
- a. If you mow the lawn, I'll give you \$5 dollars.
 - b. If you don't mow the lawn, I won't give you \$5 dollars.
 - c. I'll give you \$5 dollars if and only if you mow the lawn.

This phenomenon is known as "conditional perfection." What is relevant for us here is that conditional perfection appears to interact with neg-raising inferences: (167a) is generally also read as implicating (167c). In other words, there appears to be a neg-raising inference arising from a conditional perfection one.

- (167) a. If John believes that it's raining, he'll take the umbrella.
 b. If he believes that it isn't raining, he won't take the umbrella.

Notice, however, that (167b) is entailed by (168), hence if we can derive (168), we derive (167b).

- (168) If he doesn't believe that it's raining, he won't take the umbrella.

In section 2.6.2, I discussed that the inference that we obtain through the exhaustification of the alternatives of a neg-raising predicate in the antecedent of a conditional is at most (171), which I show is equivalent to the one in (172).

- (169) $\Box[\mathbf{believe}(p) \rightarrow q]$

- (170) a. $\text{Alt} = \left\{ \begin{array}{l} \Box[\mathbf{believe}(p) \rightarrow q] \\ \Box[(\mathbf{believe}(p) \vee \mathbf{believe}(\neg p)) \rightarrow q] \end{array} \right\}$

- (171) $\neg\Box[(\mathbf{believe}(p) \vee \mathbf{believe}(\neg p)) \rightarrow q]$

- (172) $\Diamond[\mathbf{believe}(\neg p) \wedge \neg q]$

So, how do we derive (168)? In the following, I show that we can account for the inference in (168) adopting an account of conditional perfection.

First, we need an assumption about the semantics of conditionals. I adopt the strict conditional semantics defended in von Stechow (1997) (cf. CHAPTER 5). This is not essential, for our purposes here we could adopt any other semantics that validates conditional excluded middle, that is the inference from (173) to (174) (see Lewis 1979 and Stalnaker 1980 for discussion).

- (173) a. It's false that if Mary is in town, she'll come visit.
 b. If Mary is in town, she won't come visit.

The semantics is a strict conditional semantics, whereby *if p, q* says that all p-worlds in some contextually delimited domain are q-worlds.

(174) $\Box[p \rightarrow q]$

Furthermore, it comes with two presuppositions: (a) the entertainability or compatibility presupposition in (175) that requires that there are p -worlds in the domain of quantification, and (b) the homogeneity presupposition in (176) which requires that all p -worlds are homogeneous with respect to q : either they are all q -worlds or they all are not q -worlds. This latter presupposition directly validates conditional excluded middle.

(175) **compatibility presupposition:** $\Diamond p$

(176) **homogeneity presupposition:** $[\Box[p \rightarrow q] \vee \Box[p \rightarrow \neg q]]$

Second, we need a way to account for conditional perfection. Given that nothing relies on this, I will not commit myself to any specific account. For our purposes it is enough that from a conditional *if* p , q the inference that it's false that *if* $\neg p$, q can sometimes be derived (see von Stechow 2001 and Franke 2011 for two different proposals on how to derive this). Given these two assumptions, we can now go back to the case in (167a), schematized in (177).

(177) $\Box[\text{believe}_j p \rightarrow q]$

The inference that we get from (177) given an account of conditional perfection is (178a). The homogeneity presupposition allows us to conclude (178b), which entails (179), the inference we wanted: in all worlds in which John believes that it's not raining, he won't take an umbrella.

(178) a. $\neg\Box[\neg\text{believe}_j p \rightarrow q]$

b. $\Box[\neg\text{believe}_j p \rightarrow \neg q]$

(179) $\Box[\text{believe}_j \neg p \rightarrow \neg q]$

2.9 Appendix B: an open issue for the condition on EXH

I discussed above that exhaustification of a sentence like (180a) is not blocked by the condition above in (141), so that we correctly obtain the neg-raising inference in (180b).

- (180) a. EXH[John doesn't want Mary to come]
b. John wants Mary not to come.

However, if the sentential complement of *want* contains a strong scalar term like *every* as in (181) a problem arises.

- (181) Mary doesn't want every student to come to the party.

To see the problem, notice that (181) can be read as implying (182a) and furthermore at the same time it can also give rise to the scalar implicature in (182b).

- (182) a. Mary wants not every student to come to the party.
b. Mary wants some of the students to come to the party.

If we combine the alternatives of *every* and *want*, we obtain both the neg-raising inference in (182a) and the scalar implicature in (182b): schematically the alternatives that we obtain are those in (183) and it is easy to show that when we exhaustify (181) with respect to them we obtain (184).

$$(183) \quad \left\{ \begin{array}{l} \neg[\mathbf{want}_m[\mathbf{all}]] \\ \neg[\mathbf{want}_m[\mathbf{some}]] \\ \neg[\mathbf{want}_m[\mathbf{all}] \vee \mathbf{want}_m[\neg[\mathbf{all}]] \\ \neg[\mathbf{want}_m[\mathbf{some}] \vee \mathbf{want}_m[\neg[\mathbf{some}]] \end{array} \right\}$$

$$(184) \quad \text{EXH}[\neg[\mathbf{want}_j;\mathbf{all}]] = \mathbf{want}_j;\neg\mathbf{all} \wedge \mathbf{want}_j;\mathbf{some}$$

The predictions would, therefore, be correct. However, we are in the same as we were in in the case of *want* embedding *believe* above: the presuppositions of the exhaustified sentence are stronger than those of the prejacent: the presuppositions of the prejacent are in (185a) and those after exhaustification are in (185b).

- (185) a. $\Diamond_j \mathbf{all} \wedge \Diamond_j [\neg[\mathbf{all}]]$
 b. $\Diamond_j \mathbf{all} \wedge \Diamond_j [\neg[\mathbf{some}]]$

What we are forced to do, therefore, is substitute the condition in (141) repeated in (186) with the one in (187), which is restricted to the case of exhaustification with respect to alternatives that only contain neg-raising alternatives.²⁹

- (186) EXH ϕ is defined only if:

$$\pi(\phi) = \pi(\text{EXH}[\phi])$$

- (187) EXH ϕ is defined only if:

if the alternatives are uniformly neg-raising then $\pi(\phi) = \pi(\text{EXH}[\phi])$

2.10 Appendix C: A different approach to strict NPIs and a problem with neg-raising predicates

Gajewski (2005, 2007) assumes the anti-additivity hypothesis by Zwarts (1998) on the licensing of strong NPIs. However, he himself in a different paper, Gajewski (2011), and Chierchia (to appear) discuss various issues for the anti-additivity, both empirical and conceptual. They also propose a new theory of strong NPI licensing, based on the idea that strong NPIs are sensitive to non-truth conditional meanings, while weak NPIs are not. In the following, I summarize the idea briefly and then show that presuppositional neg-raising predicates like *want* constitute a

²⁹Notice that we have to introduce a distinction between the alternatives of neg-raising from the scalar alternatives of “regular” scalar terms. However, given that the alternatives of neg-raising all have a characteristic disjunctive form we can see them as forming a natural class.

challenge for this account. Finally, I propose a tentative solution by weakening the presupposition of such predicates.

2.10.1 The problems for anti-additivity

Anti-additivity is successful in explaining a variety of contexts that license strong NPIs. However, as Chierchia (to appear) discusses, it leaves open three problems: first, certain anti-additive contexts like the restrictor of *every* and *no* do not license strong NPIs, as (190a) and (190b), from Chierchia to appear.³⁰

- (190) a. *Every student who left until his birthday missed many classes
 b. *No student who has seen Mary in weeks is upset with her

Second, von Stechow (1999) has shown that we should ignore presuppositions for the purpose of licensing weak NPIs. As seen above, he defines a notion of entailment, Strawson-entailment, that makes it possible to define a notion of downward monotonicity that, in turn, explain the distribution of weak NPIs in the scope of presuppositional triggers. However, presuppositional triggers do not appear to license strong NPIs, despite the fact that when we define anti-additivity in terms of Strawson-entailment, we have many contexts, in particular all Strawson-downward entailing contexts, that are Strawson anti-additive and yet do not license strong NPIs (Gajewski 2011). Finally, anti-additivity is a descriptive generalization, and an approach like Gajewski (2011) and Chierchia (to appear) wants instead to predict why such contexts should license strong NPIs and not others.

³⁰The anti-additivity of the restrictors of *ever* and *no* is shown by the equivalences in (188) e (96c).

- (188) a. Every red or blue book is on the table.
 b. Every red book is on the table and every blue book is on the table
- (189) a. No red or blue book is on the table.
 b. No red book is on the table and no blue book is on the table

2.10.2 Gajewski-Chierchia proposal

Gajewski (2011) and Chierchia (to appear) propose a new theory based on the idea that strong NPIs are sensitive to non-truth conditional meanings. Informally, the idea is that while presuppositions and scalar implicatures do not matter for the licensing of weak NPIs, they do matter for strong NPIs. To illustrate, consider the contrast between (191) and (192), which shows that a strong NPI like *until thursday* can appear in the scope of negation like in (191), but cannot appear felicitously in downward entailing contexts like the restrictor of a universal quantifier as shown by (192).

(191) Mary didn't leave **until Thursday**.

(192) *Every student who left **until Thursday**, missed the class on presuppositions.

The gist of the idea is that the relevant difference between (192) and (191) is that the former, but not the latter, has a presupposition (i.e., that the domain of quantification, indicated as D , and the restrictor have a non-empty intersection). The two components of the meaning of (192) can be schematized as (193a) and (193b).

- (193) a. **presupposition:** $\exists x \in D[\llbracket \text{left until thursday} \rrbracket(x)]$
b. **assertion:** $\forall x \in D[\llbracket \text{left until thursday} \rrbracket(x) \rightarrow Q(x)]$

Gajewski (2011) and Chierchia (to appear) argue that in evaluating downward entailingness for the purpose of licensing strong NPIs, we should look at the conjunction of assertion, scalar implicatures, and presuppositions. Indeed, if we do this in the case of (193a) and (193b), we do not have a downward entailing environment anymore. In other words, (194) does not entail (195), for any predicate P .

(194) $\exists x \in D[\llbracket \text{left until thursday} \rrbracket(x)] \wedge \forall x \in D[\llbracket \text{left until thursday} \rrbracket(x) \rightarrow Q(x)]$

(195) $\exists x \in D[(\llbracket \text{left until thursday} \rrbracket(x) \wedge P(x))] \wedge \forall x \in D[(\llbracket \text{left until thursday} \rrbracket(x) \wedge P(x)) \rightarrow Q(x)]$

In sum, the Gajewski-Chierchia approach predicts that presuppositions should always interfere with the licensing of strong NPIs. Now I turn to show that when we consider neg-raising desire predicates, we run into a problem for this hypothesis.

2.10.3 The problem with neg-raising desire predicates

The problem arises when we look at the case of neg-raising predicates like *want* or *intend*. The semantics we assumed is the one in (196).

- (196) $\llbracket \text{want} \rrbracket(f)(p)(a)(w)$
- a. only defined iff

$$\exists w' \in f(a, w)[p(w')] \wedge \exists w' \in f(a, w)[\neg p(w')]$$
 - b. when defined true iff

$$\forall w' \in \text{BEST}_{g(a, w)}(f(a, w))[p(w')]$$

Notice now that in the case of (197) the licensing of the strong NPI *until Thursday* is not expected.

- (197) John doesn't want Mary to leave **until Thursday**.

This is because once we consider the conjunction of assertion and presupposition the context in which *until Thursday* is in is not downward entailing anymore, as schematically shown in (198), where ϕ = "Mary leave until Thursday".

- (198) $\exists w' \in f(j, w)[\phi(w')] \wedge \exists w' \in f(j, w)[\neg \phi(w')] \wedge \neg \forall w' \in \text{BEST}_{g(j, w)}(f(j, w))[\phi(w')]$

In essence, what (198) says is that it's possible for John that Mary leave until thursday and it's possible for John that Mary doesn't leave until thursday and John doesn't want that Mary leaves until thursday. So the presupposition creates a positive context that disrupts the

downward monotonicity, hence we predict that (197) should be infelicitous.³¹

2.10.4 The solution

The solution that I propose is to weaken the presupposition of *want*.³² Recall that the presupposition of *a wants p* adopted above is in (201).

- (201) $\llbracket \text{want} \rrbracket(f)(p)(a)(w)$
- a. only defined iff

$$\exists w' \in f(a, w)[p(w')] \wedge \exists w' \in f(a, w)[\neg p(w')]$$
 - b. when defined true iff

$$\forall w' \in \text{BEST}_{g(a, w)}(f(a, w))[p(w')]$$

I propose now that we should weaken it to that in (202), which only requires that if *a* thinks that *p* is possible, then *a* thinks that also $\neg p$ is.

- (202) $\llbracket \text{want} \rrbracket(f)(p)(a)(w)$
- a. only defined iff

$$\exists w' \in f(a, w)[p(w')] \rightarrow \exists w' \in f(a, w)[\neg p(w')]$$
 - b. when defined true iff

$$\forall w' \in \text{BEST}_{g(a, w)}(f(a, w))[p(w')]$$

Notice that both occurrences of *p* are now in a downward entailing environment, hence no intervention is predicted. There remains, however, the issue that a sentence like (203) in the

³¹Notice that it is irrelevant for the problem whether or not, given an account of neg-raising, we also conclude (199), schematized in (200), from (197), as the presupposition part remains the same.

(199) John wants Mary not to leave **until Thursday**.

(200) $\exists w' \in f(j, w)[\phi(w')] \wedge \exists w' \in f(j, w)[\neg \phi(w')] \wedge \forall w' \in \text{BEST}_{g, w}(f(j, w))[\neg \phi(w')]$

³²thanks to Gennaro Chierchia (p.c.) for this suggestion.

semantics adopted here would be false, instead of a presupposition failure, if Mary believes that p is not possible.

(203) Mary wants that p

As von Stechow (2004) among others discusses, it is unclear that our intuitions about the difference between presuppositions failure and falsity are reliable, so this new prediction might be defensible.

Chapter 3

The presuppositions of soft triggers are obligatory scalar implicatures

3.1 Introduction

In CHAPTER 2, I introduced the distinction between soft and hard presuppositional triggers, a much discussed topic in the presupposition literature.¹ The challenge for presupposition theories is explaining both the differences and similarities between the two classes of triggers. Let us go through them here briefly. First, soft and hard presuppositions appear to pattern alike with respect to the projection behavior when embedded in propositional connectives. To see this, consider the case of *win* and *it*-clefts, a paradigmatic example of a soft and hard trigger, respectively. A sentence with *win* like (1a) gives rise to the inference in (1b) and so do its negation in (1c), a conditional with (1a) embedded in the antecedent like (1d) and the questioned version of (1a) in (1e). Analogously, (2a) and also (2c)-(2d) give rise to the inference in (2d).

- (1) a. Bill won the marathon.
 b. Bill participated in the marathon.
 c. Bill didn't win the marathon.

¹see Karttunen 1971, Stalnaker 1974, Chierchia and McConnell-Ginet 2000, Simons 2001, Abusch 2002, 2010, Abbott 2006 and Klinedinst 2010 among others.

- d. If Bill won the marathon, he will celebrate tonight.
 - e. Will Bill win the marathon?
- (2)
- a. It is Mary who broke that computer.
 - b. Somebody broke that computer.
 - c. It isn't Mary who broke that computer.
 - d. If it is Mary who broke that computer, she should repair it.

Second, however, soft and hard presuppositions differ with respect to whether they can be easily suspended. In particular, the test that I used in CHAPTER 2 and that I will use throughout this thesis as the diagnostic for softness is “the explicit ignorance test” by Simons (2001). The idea is creating a context in which the speaker is evidently ignorant about the presupposition; those triggers that do not give rise to infelicity in such contexts are soft triggers. The following two examples modeled from Abusch 2010 show that according to this test *win* and *it*-clefts are indeed soft and hard triggers respectively.²

²The boundaries of the soft vs. hard distinction are not uncontroversial (see Abbott 2006 and Klinedinst 2010 for discussion). There are two main controversial cases: the first case is the status of definite descriptions or possessives, which in some cases like (3) appear to behave like soft triggers, while in others like (4) they do not.

- (3) I do not know if Jane has a brother, but if that guy she came in with is her brother the party will be fun
- (4) I don't know if Jane has a brother, #but if her brother comes tonight the party will be fun

The distinction between (3) and (4) might be traced back to a difference between argumental and predicative positions (cf. Doron 1983; see also von Stechow 2004). In the following, I put aside these controversial cases, and focus on paradigmatic cases like *win* and *stop*.

The second case regards some apparent differences among factive predicates. Karttunen (1971) observes that *discover* and *regret* pattern differently in cases like (5a) and (5b) (from Karttunen 1971): the presupposition that I didn't tell the truth is suspended in (5a) but appears to go through in (5b).

- (5) a. If I discover later that I didn't tell the truth, I will confess it to everyone.
- b. If I regret later that I didn't tell the truth, I will confess it to everyone.

Karttunen (1971) proposes to distinguish between two different classes of factives. Stalnaker (1974) argues that the difference between cases like (5a) and (5b) can, instead, be given a pragmatic explanation. I ignore this issue here and treat all factives uniformly as soft triggers. Notice that the present proposal is compatible with a pragmatic explanation à la Stalnaker (1974), which can provide a source of difference among soft triggers.

(6) I don't know whether Bill ended up participating in the Marathon yesterday.

But if he won, he will celebrate tonight.

(7) I don't know whether anybody broke that computer.

#But if it is Mary who did it, she should repair it.

In addition to the speaker saying that she is ignorant about the presupposition, we can also create explicit ignorance contexts, when we make it clear that the speaker does or cannot know whether the presupposition is true. The case in (8) uttered in a conversation between two people who are meeting for the first time is an example of this sort (from Geurts 1995 reported in Simons 2001): (8) is felicitous and the presupposition of *stop*, i.e. that the addressee used to smoke, is clearly suspended.

(8) I noticed that you keep chewing on your pencil. Have you recently stopped smoking?

Finally, soft and hard presuppositions also differ when embedded in quantificational sentences (Charlow 2009, Fox 2012b; see also Chemla 2009b). The observation, due to Charlow (2009), is that a sentence like (9a) with the hard trigger *also* typically leads to the universal inference in (9b), while the sentence in (10a), with the soft trigger *stop*, does not lead to the corresponding inference in (10b).

(9) a. Some of these 100 students quit smoking.

b. Each of these 100 students used to smoke.

(10) a. Some of these 100 students also smoke [Marlboro]_F

b. Each of these 100 students smoke something other than Marlboro.

In sum, a theory of the soft-hard presuppositions distinction has to account for the difference with respect to suspendability and the similarity and differences with respect to projection that they exhibit.

Another point of debate is that while the defeasibility of soft presuppositions may suggest an analysis that treats them as implicatures, as I discuss below there are also differences between them, suggesting that any proposal that tries to account for one in terms of the other, has to account for their differences too.

In CHAPTER 2, I have defended a scalar implicature-based account of neg-raising inferences building on two ideas which have been put forward in the literature in connection to (soft) presuppositions: first, soft triggers can be thought of as non-presuppositional items associated to lexical alternatives (Abusch 2002, 2010; see also Chierchia 2010). Second, the projection behavior of presuppositions can be given an account in terms of a theory based on scalar implicatures (Chemla 2009a, Chemla in preparation). In this and CHAPTER 4, I extend this scalar account to give a theory of soft presuppositions. I focus, in particular, on five aspects of the proposal. First, in this chapter, I propose an account for why soft presuppositions are similar and different from hard presuppositions, on one hand, and scalar implicatures, on the other, based on the notion of obligatoriness of scalar implicatures (Chierchia 2006, to appear, Spector 2007a, Magri 2010a). Second, I discuss how the proposal here can account for the projection behavior of soft presuppositions from the scope and the restrictor of quantificational sentences, a combination of predictions that is not made by any of the existing alternative theories that I am aware of. Third, I follow Abrusán's (2011a) solution to the triggering problem of soft presuppositions, that is the question about where the presupposition of soft triggers come from. In particular, I adopt and adapt her algorithm in order to give a principled explanation about the source of the lexical alternatives of soft triggers. Fourth, in CHAPTER 4, I show that given its syntactic-semantic nature, the present proposal can account for the intervention effects by soft presuppositions in the licensing of negative polarity items (NPIs) (Homer 2010, Chierchia to appear). As I discuss below, this account of intervention constitutes one of the main arguments for a syntactic-semantic approach like the one proposed here, versus purely pragmatic alternatives in the literature. Finally, I show that the present proposal can also account for some puzzling cases of the interaction between soft presuppositions and "regular" scalar implicatures.

This chapter is organized as follows: in section 3.2, I summarize the three main ideas from Abusch 2002, 2010, Chemla 2009a and Abrusán 2011b,a, together with some historical predecessors in the literature. In section 3.3, I outline the implementation of the proposal and its first predictions. In section 3.4, I show how to account for the differences between soft and hard presuppositions, on one hand, and soft presuppositions and scalar implicatures, on the other. In section 3.5, I discuss the predictions for quantificational sentences, and in section 3.6, I summarize and conclude the chapter. Finally, in Appendix A, I discuss the connection between the account of neg-raising inferences outlined in CHAPTER 2 and the one of soft presuppositions presented in this chapter.

3.2 Alternatives, projection and triggering

As mentioned above, this chapter builds on three ideas/observations: (a) the class of presuppositions is not homogeneous, (b) a principled explanation can be given for how such suspendable presuppositions come about in the first place, (c) those presuppositions can be reduced to (scalar) implicatures in how they project. While these ideas in their most developed forms are due to Abusch (2002, 2010), Abrusán (2011b) and Chemla (2009a), respectively, before summarizing their proposals, I want to briefly point to some predecessors in the literature.

The observation that certain triggers appear more easily suspendable than others goes back to a discussion between Karttunen (1971) and Stalnaker (1974) about apparent differences between factive verbs (see fn. 3 above). Stalnaker (1974) is also one of the first to explore the role of implicatures in the suspension of presuppositions, by proposing that the differences between triggers could in fact be accounted for by taking into consideration general conversational principles. Gazdar (1979) develops a theory of presuppositions in which implicatures play a crucial role in the projection/non-projection of presuppositions, and Soames (1979), in a different way, also maintains the idea that implicatures play a role in the non-projection of presuppositions.³

³More recently, Beaver (2004) proposes that the relevant factor in soft presupposition suspension is intonation, rather than implicatures. See, however, Wagner 2012:pp.8-9 for some challenging examples for this idea. Other recent accounts of the soft-hard trigger distinction are Simons 2001, Abbott 2006 and Klinedinst 2010. I don't discuss their attempts here for lack of space; for detailed criticism of Simons's (2001) proposal, see Abrusán 2011a.

Attempts at giving an answer to the question of how presuppositions arise go back to Sperber and Wilson (1979) and Stalnaker (1974) again. The idea was to distinguish among the entailments of a sentence and give a principled explanation for deciding which ones should be perceived as presuppositions rather than simple entailments. Abrusán 2011b,a constitute an explicit development of these early attempts.⁴ Finally, the attempt of reducing the projection of presuppositions to implicatures can be traced back to Kempson 1975 and Wilson 1975. In particular, Wilson (1975) explicitly defends the idea that an unembedded sentence like (11a) simply entails (11d), while its negation and a complex sentence embedding (11a) like (11c), conversationally implicate (11d).

- (11) a. John regrets that Bill is ill.
- b. John doesn't regret that Bill is ill.
- c. If John regrets that Bill is ill.
- d. Bill is ill

In other words, she reduces the projection of presuppositions to an epiphenomenon arising from looking together at the entailments of unembedded sentences and (certain) implicatures of (certain) complex sentences embedding them. While Wilson's (1975) account faces a variety of problems, as discussed in detail by Soames (1979), the spirit of the idea is the same as the one by Chemla (2009a), that I discuss below.

Summing up, the observation of the non-homogeneity of the class of presuppositions, attempts at giving principled explanations to the triggering problem and reducing their projection behavior to implicatures have been present in the literature in one form or other, for a while. However, it is only recently that these ideas have taken sufficiently empirically adequate forms in the works of Abusch (2002, 2010), Chemla (2009a) and Abrusán (2011b). In the next section, I summarize each of them, by also drawing a brief comparison with the present proposal.

Abbott (2006) herself points out some empirical problems for her proposal. I leave the comparison with Klinedinst's (2010) proposal for further research.

⁴See Abrusán 2011b,a and Abusch 2010 for discussion of the problems of the accounts by Sperber and Wilson (1979) and Stalnaker (1974).

3.2.1 Abusch (2002 2009): soft triggers and lexical alternatives

In CHAPTER 2, I discussed the the pragmatic account of soft presuppositions based on lexical alternatives proposed by Abusch (2002, 2010). The gist of the proposal is that the semantics of a soft trigger does not contribute a semantic presupposition but it provides a set of lexical alternatives. For instance (12a), schematized in (12b), has the alternatives in (12c).

- (12) a. Bill won.
b. **won**(b)
c. $\text{Alt}(12b) = \left\{ \text{won}(b), \text{lost}(b) \right\}$

Furthermore, she postulates a pragmatic principle which optionally applies on these alternatives by requiring that their disjunctive closure, indicated as $\vee \text{Alt}$, is true. The hypothesis is that this pragmatic principle is the source of the soft presupposition inference. For instance in the case above the disjunctive closure of the alternatives entails (13b).

- (13) a. $\vee \{ \text{won}(b), \text{lost}(b) \} = (\text{won}(b) \vee \text{lost}(b))$
b. **participated**(b)

Once generated in this way, soft presuppositions project into complex sentences given a dynamic framework along the lines of Heim 1983 and the fact that, formulated as in (14), the principle makes reference to the local contexts created by the context change potentials of the dynamic meanings that make up the sentences.

- (14) If a sentence ψ is uttered in a context with common ground c and ψ embeds a clause ϕ which contributes an alternative set Alt , then typically c is such that the corresponding local context d for ϕ entails that some element of Alt is true.

As Abusch (2010) shows, this effectively mimics the projection behavior of semantic presuppositions, by applying the pragmatic default globally, in a way that makes reference to the local context of the trigger. However, as I mentioned in CHAPTER 2, this is at odds with standard

assumptions about the semantics-pragmatics interface, whereby pragmatics only has access to an output of the semantics, generally thought to be a proposition (or a set of propositions). (14), instead, makes reference to local contexts from the global level, thus it needs the semantics to keep track of the history of the semantic composition in terms of the context change potentials and then make it somehow visible to pragmatics. Abusch (2002) acknowledges this issue.

The pragmatic generalization [...] refers to an embedded information state *d*. If we just have the semantic value of the sentence (a certain dynamic proposition or file change potential), it is not possible to apply the condition, because to apply it, one has to find the *d* which corresponds to the global *c*. To apply the condition, one has to have access to something like a structured proposition (Lewis 1972) which stores the pieces from which the semantic value is composed. [...] This is a less strict separation of semantics from pragmatics, because more of the semantics is visible to the pragmatics.”

Beyond this conceptual issue, I also discussed two empirical problems for Abusch’s (2010) proposal: first, it fails to predict any differences between the projection behavior of soft and hard presuppositions. However, this appears to be wrong in the case of quantificational sentences, where, as mentioned above, soft and hard triggers project differently. Second, as noticed by Sauerland (2008), it makes predictions that are too weak in the case of a soft trigger embedded into another. For instance, it predicts that (15a) should give rise to the inference in (15b) but not to the attested inference in (15c).

- (15) a. John didn’t stop winning.
 b. John used to participated.
 c. John used to win.

Chemla (2009a) proposes to look at presuppositions as a scalar phenomenon and points out that doing so could account for the projection facts without having to postulate any of the extra assumptions in Abusch 2010. We encountered already this idea in CHAPTER 2, I now want to look at it in more detail in connection to soft presuppositions.

3.2.2 Chemla (2009): the projection of presuppositions as a scalar phenomenon

The proposal in Chemla 2009a is based on the idea that presuppositional triggers are identical to strong scalar items like *every*. In other words, in his approach, an atomic expression ϕ that intuitively presupposes p has p as its weaker alternative. For instance, (16b) is both an entailment and an alternative of (16a), as shown in (31c).⁵

- (17) a. Bill won.
 b. Bill participated.
 c. $\text{Alt}(17b) = \left\{ \text{won}(b), \text{participated}(b) \right\}$

As Chemla shows, the proposal predicts the apparent projection behavior through negation, since the negation of (17a), in (18a), has the alternatives in (18c). Given that negation inverts entailment relations, the alternative *Bill didn't participate* is stronger than the assertion (i.e., *Bill didn't win*). Assuming any theory of scalar implicatures, we obtain the negation of *Bill didn't participate* (i.e., Bill participated) as an inference of (18a). In other words, we obtain (18b) as a scalar implicature of (18a).⁶

- (19) a. Bill didn't win.
 b. Bill participated.

⁵The fact that (31b) is an entailment of (31a) is shown by (16).

- (16) Bill won #but didn't participate.

⁶As Chemla (2009a) points out, one could describe the inference of (16a) in (16b) as projecting through negation, when (16a) is negated in (17a); however, like in Wilson's (1975) proposal above, in this account, this inference is a simple entailment in the case of (16a) and a scalar implicature in the one of (17a). Chemla (2009a) also observes that this is entirely parallel to the behavior of scalar implicatures coming from strong scalar terms, like the ones in (33a) and (33b), which both give rise to the inference in (22) (see also Beaver 2001).

- (18) a. Every student came.
 b. Not every student came.
 c. Some student came

(22) is a plain entailment of (33a) and, as I show below, it is predicted to be a scalar implicature of (33b).

$$c. \text{ Alt}(19b) = \left\{ \neg\text{won}(b), \neg\text{participated}(b) \right\}$$

In the same way as above, the fact that both (18a) and its negation in (19a) give rise to the same inference is what creates the appearance of projection through negation.

Beyond negation, the proposal also predicts that in the case of quantificational sentences the projection behavior should depend on the quantifier involved. The pattern predicted by this proposal is that a sentence like (20a) gives rise to the universal inference in (20b), while (21a) and (36a) do not give rise to the corresponding inferences in (21b) and (36b). As I discuss below, this is in line with the experimental results reported in Chemla (2009b).

- (20) a. Each of these ten students won.
- b. Each of these ten students participated.

- (21) a. More than three of these ten students won the marathon.
- b. Each of these ten students participated in the marathon.

- (22) a. Less than three of these ten students won the marathon.
- b. Each of these ten students won the marathon.

While successful with the cases above, as Chemla (2009a) observes, the proposal as it is does not make the right predictions for presupposition projection from the scope of negative quantifiers. This is because it predicts the existential inference in (23b), while the participants of Chemla's (2009b) experiment reported the strong universal inference in (23c) for sentences like the one in (23a).

- (23) a. None of these ten students won the marathon.
- b. Some of these ten students participated in the marathon.
- c. Each of these ten students participated in the marathon.

More precisely, the inference in (23c) from (23a) was accepted more often than the analogous inference with a scalar implicature in (24c) from (24a).

- (24)
- a. None of these ten students did all of the readings.
 - b. Some of these ten students did all of the readings.
 - c. All of these ten students did some of the readings.

This difference constitutes a challenge for any proposal that reduces the behavior of soft presuppositions to that of scalar implicatures, since it would predict parallel behavior across the board, contrary to the data just discussed.

Chemla (in preparation) following his idea in Chemla 2009a, proposes a novel unified account of presuppositions and scalar implicatures. I refer the reader to his paper for the details of his account, here I want to emphasize three aspects that are relevant for the comparison with the present proposal.

The first aspect regards the fact that he responds to his own challenge about the difference between presuppositions and scalar implicatures by abandoning the idea that presuppositional triggers are identical to strong scalar items, and assuming different alternatives for scalar implicatures and presuppositions. In doing so, he can account for the difference between the projection from the scope of negative quantifiers just discussed, because he only predicts existential inferences in the case of scalar implicatures, while universal inferences for the case of presuppositions. In other words, he only predicts the inference in (24b) for a case like (24a), while he predicts the inference in (23c) from (23a). I argue, however, that while there is a difference with the inference in (23c), the universal inference in (24c) from (24a) is also present in some cases and this is not predicted by Chemla (in preparation).⁷

⁷Chemla himself, in a different paper (Chemla 2008), discusses the example in (25a) and observes that it could have the inference in (25b).

- (25)
- a. None of these 10 teachers killed all of their students.
 - b. All of these 10 teachers killed some of their students.

In this chapter, I propose to develop Chemla's (2009a) idea differently, responding to his challenge about negative quantifiers in a way that allows us to predict the inferences from (23a) to (23c), from (30a) to (30c), and their difference. The proposal has two components: first, I show that if we look carefully at the alternatives of negative quantifiers, we do actually predict the possibility of universal projection from their scope, both for soft presuppositions and for scalar implicatures. Second, I propose a way to account for the difference between soft presuppositions and scalar implicatures in terms of the notion of obligatory implicatures. As a further consequence, the alternatives assumed here allow an account of the projection of soft presuppositions within negative quantifiers and in particular of the asymmetry between nuclear scope and restrictor, which is not accounted for by Chemla (in preparation) and other recent accounts

An argument for the existence of inferences like (25b) comes from the felicity condition on the utterance of disjunctive sentences that I presented in CHAPTER 1, also known as "Hurford's constraint" (Hurford 1974; see also Singh 2008b). On the basis of this constraint, Chierchia et al. (To appear) construct a case for the existence of the inference in (26b) from (26a).

- (26) a. All of the students did some of the readings
 b. None of the students did all of the readings

The logic of the argument is as follows: one creates a disjunction, where one of the disjunct entails the other in all readings of (29a) but the one with the scalar implicature in (29b). The case Chierchia et al. (To appear) construct is (27), which is felicitous and is compatible with Hurford's constraint, only if we interpret (27) as (28).

- (27) Every student solved some of the problems, or Jack solved all of them and all the other students solved only some of them.
- (28) Every student solved some but not all of the problems, or Jack solved all of them and all the other students solved only some of them.

We can apply the same logic to the case in (29a), repeated from above, and construct a disjunction that is felicitous under Hurford's constraint only if we assume that the first disjunct has the scalar implicature in (29b).

- (29) a. None of the students did all of the readings.
 b. All of the students did some of the reading.

The disjunction in (30) is such that the second disjunct entails the first one unless the latter has the implicature in (29b).

- (30) None of my professors failed all of their students or Gennaro failed none and all of the others failed just some.

To my ears, while a little involved as a sentence, (30) is felicitous, thereby supporting the existence of the inference in (29b).

I am aware of.

The second aspect that distinguishes the present proposal from Chemla's (in preparation) account is that the former is not a theory of presuppositions in general but it is restricted to soft presuppositions. As I discuss below, this can account for the differences between soft and hard presuppositions in terms of ease of suspension and projection in quantificational sentences.⁸

The third relevant difference regards the fact that the present proposal is based on the grammatical theory of scalar implicature, which postulates the presence of a syntactically realized exhaustivity operator. As I show below, this operator in the syntax predicts the intervention effects of soft presuppositions in the licensing of NPIs.

Summing up, the present proposal develops the idea proposed in Chemla (2009a), differently from the alternative route proposed in Chemla in preparation. As I show below in detail, the contributions of the present proposal are: first, the alternatives for negative quantifiers proposed here make better predictions both for the case of scalar implicatures and for the one of soft presuppositions from scopes and restrictors of negative quantifiers. Second, restricting the theory to soft presuppositions, we can account for the differences between them and hard presuppositions. Furthermore, assuming a difference between scalar implicatures and soft presuppositions in terms of obligatoriness, we can account for their different behavior. Finally, the fact that the proposal here is based on an exhaustivity operator in the syntax allows an account of the intervention effects of soft presuppositions. I turn now to the triggering problem for the case of soft presuppositions.

— The proposal in Chemla 2009a is based on the idea that presuppositional triggers are identical to strong scalar items like *every*. In other words, an expression X that intuitively presupposes p, has p as its weaker alternative. For instance, (31a), would have (31c) as alternatives, that is, (31b) is, both an entailment and an alternative of (31a).

(31) a. Bill won.

⁸Notice that one could also restrict Chemla's (in preparation) account to soft presuppositions. If one doesn't, however, one has to provide a different way to account for the differences between soft and hard presuppositions with respect to context dependence and projection (see Chemla in preparation:p.41 for discussion).

- b. Bill participated.
- c. $\text{Alt}(31b) = \left\{ \mathbf{won}(b), \mathbf{participated}(b) \right\}$

As he shows, the proposal immediately predicts the apparent projection behavior through negation, since the negation of (31a), in (32a), has the alternatives in (32c). Given the fact that negation inverts entailment relations, the alternative *Bill didn't participate* is stronger than the assertion, *Bill didn't win*, hence, assuming any theory of scalar implicatures, we obtain the negation of *Bill didn't participate* as an inference of (32a). Now, it is easy to see that the negation of *Bill didn't participate* is just (32b). In other words, we obtain (32b) as a scalar implicature of (32a).

- (32) a. Bill didn't win.
- b. Bill participated.
- c. $\text{Alt}(32b) = \left\{ \neg \mathbf{won}(b), \neg \mathbf{participated}(b) \right\}$

As Chemla (2009a) points out, one could describe the inference of (31a) in (31b) as projecting through negation, when (31a) is negated as in (32a); however, like in Wilson's (1975) proposal, in this account, this inference is a simple entailment in the case of (31a) and a scalar implicature in the one of (32a). Chemla (2009a) also observes that this is entirely parallel to the behavior of scalar implicatures coming from strong scalar terms, like the ones in (33a) and (33b), which both give rise to the inference in (22) (see also Beaver 2001).

- (33) a. Every student came.
- b. Not every student came.
- c. Some student came

In the same way as above, the fact that both (33a) and its negation in (33b) give rise to the same inference in (33c) is what creates the appearance of projection through negation.

Beyond negation, the proposal also predicts that in the case of quantificational sentences the projection behavior should depend on the quantifier involved. The pattern predicted by this proposal is that a sentence like (34a) gives rise to the universal inference in (34b), while (35a) and (36a) do not give rise to the corresponding inferences in (35b) and (36b). As I discuss below, this is in line with the experimental results reported in Chemla (2009b).

- (34) a. Each of these ten students won.
- b. Each of these ten students participated.
- (35) a. Some of these ten students won the marathon.
- b. Each of these ten students participated in the marathon.
- (36) a. Less than three of these ten students won the marathon.
- b. Each of these ten students won the marathon.

While successful with the cases above, as Chemla (2009a) observes, the proposal as it is does not make the right predictions for presupposition projection from the scope of negative quantifiers. This is because it predicts the existential inference in (37b), while the participants of Chemla's (2009b) experiment reported the strong universal inference in (37c) for sentences like the one in (37a).

- (37) a. None of these ten students won the marathon.
- b. Some of these ten students participated in the marathon.
- c. Each of these ten students participated in the marathon.

More precisely, the inference in (37c) from (37a) was accepted more often than the analogous inference with a scalar implicature in (38c) from (38a).

- (38) a. None of these ten students did all of the readings.
- b. Some of these ten students did all of the readings.
- c. All of these ten students did some of the readings.

This is, hence, a challenge for any proposal that reduces the behavior of soft presuppositions to the one of scalar implicatures, since it would predict parallel behavior across the board, contrary to the data just discussed.

In this chapter, I develop Chemla's (2009a) idea and respond to his challenge about negative quantifiers. First, I argue that while there is a difference with the inference in (37c), the universal inference in (38c) from (38a) is also possible in some cases. Chemla himself, in a different paper (Chemla 2008), discusses the example in (39a) and observes that it could have the inference in (39b).

- (39) a. None of these 10 teachers killed all of their students.
 b. All of these 10 teachers killed some of their students.

The theory that I propose in this chapter can account both for the inference from (39a) to (39b) and for the difference between the latter and the corresponding case involving soft presuppositions like (37a) above. The proposal has two components: first, I show that if we look carefully at the alternatives of negative quantifiers, we do actually predict the possibility of universal projection from their scope, both for soft presuppositions and for scalar implicatures. Second, I propose a way to account for the difference between soft presuppositions and scalar implicatures in terms of the notion of obligatory implicatures. As a further consequence, the alternatives assumed allow an account of the projection of soft presuppositions within negative quantifiers and in particular of an asymmetry between soft presuppositions coming from soft triggers embedded in the nuclear scope on one hand and the one coming from soft triggers embedded in the restrictor on the other; a difference that is not accounted for by alternative accounts in the literature I am aware of. Chemla (in preparation) following his idea, proposes an account of presuppositions as scalar implicatures, responding to his own challenge about the difference between presuppositions and scalar implicatures differently: he abandons the idea that presuppositional triggers are identical to strong scalar items, and assume different alternatives for scalar implicatures and presuppositions. I compare his account and the one proposed here in the Appendix A of CHAPTER 4.

In sum, building on Chemla's (2009a) idea, I propose here a scalar approach to soft presuppositions. As I discuss below in detail, the contributions of the proposal are: first, the alternatives for negative quantifiers that I propose here make the right predictions both for the case of scalar implicatures and for the one of soft presuppositions from scopes and restrictors of negative quantifiers. Second, restricting the theory to soft presuppositions, we can account for the difference between them and hard presuppositions. Furthermore, assuming a difference between scalar implicatures and soft presuppositions in terms of the notion of obligatory implicatures, we can, in turn, account for their different behavior. I turn now to the triggering problem for the case of soft presuppositions.

3.2.3 Abrusan (2011, to appear): the triggering of soft presuppositions

Abrusán (2011b,a) proposes a solution to the triggering problem for soft presuppositions, in the form of a selection process among the entailments of a sentence. The intuition, following Stalnaker (1974), is the idea that entailments of a sentence that are not about the main point conveyed by the sentence are perceived as presupposed. She uses a notion of aboutness formalized by Demolombe and Farinas del Cerro (2000); without going into the detail of the formalization, for which I refer the reader to Abrusán's (2011b) paper, the intuition behind this notion is that a sentence is about an entity if and only if its truth value can change if we change the truth value of the facts about that entity. The way this notion is applied to soft presuppositions is as follows: entailments that are about the event time of the matrix predicate of the sentence are part of the main point of the sentence, while the ones that are not about the event time of the matrix predicate are independent and end up being presupposed. Consider the example in (40a) and its entailments in (40b) and (40c).

- (40) a. John knows (at t_1) that Fred left (at t_2)
 b. John believes (at t_1) that Fred left (at t_2)
 c. Fred left (at t_2).

Intuitively, (40b) is about the time denoted by t_1 and (40c) is not: changing the properties of the world at time t_1 won't change the truth-value of (40c) but might change the one of (40b). The definition of the triggering of soft presuppositions she proposes is (42).⁹

- (42) **Soft presupposition triggering** Entailments of a sentence S that can be expressed by sentences that are not about the event time of the matrix predicate of S are presupposed.

Notice that Abrusán (2011a) assumes that the definition in (42) only applies to unembedded sentences. Abrusán (2011b,a) assumes that a separate projection mechanism derives the presuppositions of complex sentences, on the basis of the atomic ones generated by such mechanism. What I do below is modify trivially the definition above, in order to make it an algorithm for selecting which entailments become alternatives and not presuppositions directly. Then, I use Chemla's (2009a) idea for predicting the projection of soft presuppositions.

3.3 An exhaustivity-based theory of soft presuppositions

In this section, I present a development of the scalar approach to presuppositions in terms of the exhaustification-based theory of scalar implicature presented in CHAPTER 1. As I discuss in CHAPTER 4, the fact that this theory is based on syntactically realized exhaustivity operators will turn out to be crucial, in particular when we turn to explaining the intervention effect of soft presuppositions in the licensing of NPIs. Furthermore, I show that since this theory of SIs relies on the notion of obligatory implicatures, we can also appeal to it as a means to account for the differences between soft presuppositions and scalar implicatures. Finally, I discuss how by

⁹Notice that the time of the embedded sentence can coincide with the one of the matrix predicate, in the sense that both are true at the same time, like in (41a). In this case, changing the properties of the world at time t_1 would change the truth-value of (41c). However, this being at the same time is accidental and not intrinsic like the one of (40a) and (40b) (or (41a) and (41b)). In order to distinguish between these cases, Abrusán (2011b) uses a representation of sentences in which accidental temporal overlap is ignored.

- (41) a. John knows (at t_1) that Fred is here (at t_1).
 b. John believes (at t_1) that Fred is here (at t_1)
 c. Fred is here (at t_1).

assuming independently motivated alternatives for negative quantifiers, we can account for the pattern of projection in quantificational sentences, and in particular for the asymmetry between the projection from the restrictor and from the scope of negative quantifiers.

3.3.1 Alternatives for soft presuppositions and the triggering problem

Following Chemla (2009a), I assume that soft triggers are strong scalar items: they are associated with a set of lexical alternatives, of which they are the strongest elements.¹⁰ For instance, we associate soft triggers like *win*, *know* and *stop* with lexical alternatives as in (43b), (44b) and (45b).

- (43) a. $\llbracket \text{win} \rrbracket = \lambda x[\mathbf{win}(x)]$
 b. $\text{Alt}(43a) = \{\lambda x[\mathbf{win}(x)], \lambda x[\mathbf{participate}(x)]\}$
- (44) a. $\llbracket \text{know} \rrbracket = \lambda p \lambda x[\mathbf{know}_x(p)]$
 b. $\text{Alt}(44a) = \{\lambda p \lambda x[\mathbf{know}_x(p)], \lambda p \lambda x[p]\}$
- (45) a. $\llbracket \text{stop} \rrbracket = \lambda P \lambda x[\mathbf{stop}(x, P)]$
 b. $\text{Alt}(45a) = \{\lambda P \lambda x[\mathbf{stop}(x, P)], \lambda P \lambda x[\mathbf{used-to}(x, P)]\}$

I assume that these alternatives become sentential alternatives in the way outlined in CHAPTER 1, so that for instance, in (46a), the alternatives are the ones in (46b) and similarly the alternatives of (47a) are the ones in (47b) and the ones of (48a) are in (48b).

- (46) a. John won.
 b. $\{\mathbf{won}(j), \mathbf{participated}(j)\}$
- (47) a. John doesn't know that it is raining
 b. $\{\neg \mathbf{know}_{j,w}(p), \neg p(w)\}$
- (48) a. Mary didn't stop smoking.

¹⁰I am assuming the notion of generalized entailment defined in CHAPTER 1.

- b. $\{\neg\text{stop}(m, \text{smoke}), \neg\text{used-to}(m, \text{smoke})\}$

The question at this point is of course where these alternatives come from. Notice that this is once again the triggering problem (i.e., where presuppositions come from) but this time in a different guise. This is because theories of presuppositions that are based on alternatives do not automatically solve the triggering problem, but rather reframe it so as to question the origin of the alternatives instead: where the alternatives come from and why those alternatives and not others (see Schlenker 2010 for discussion). Here is where I adopt Abrusán's (2011b) idea and propose that these alternatives represent a subset of their lexical entailments which can be characterized systematically. Her notion of aboutness gives us a way to characterize this subset of lexical entailments. Specifically, it tells us why, for instance, *John believes that it is raining* is not an alternative of (49a). Recall that her idea is that a lexical entailment of a sentence is not about the event time of the matrix predicate if it does not co-occur with it. As seen above, (49a) entails (49b) and (49c), but only (49c) is not about the matrix event time in Abrusán's (2011b) system.

- (49) a. John knows that it is raining.
 b. John believes that it is raining.
 c. It is raining.

While she argues that (49c) becomes a presupposition of (49a), I propose to trivially modify her procedure so that (49c) becomes an alternative of (49a), while (49b) does not. Her notion can systematically distinguish the entailments that I assume are among the alternatives from the ones that are not. In other words. For instance, it tells us that (50b), but not (50c), should be an alternative of (50a).¹¹

¹¹One might ask at this point why we should treat certain entailments as alternatives in the case of soft triggers but not do the same in the case of hard triggers (see also Abbott 2006 for a similar criticism of Abusch's (2002) system). Notice that Abrusán's (2011b) algorithm can only apply to presuppositional verbs, or triggers for which the presupposition can be traced back to the presence of a verb in the sentence. Hence, if she is right, the proposed algorithm is indeed expected to apply only to soft triggers. There is an open question here about the status of definite descriptions or possessives (see footnote 3 above). Thanks to Marta Abrusan (p.c.) for discussion on this point.

- (50)
- a. John stopped smoking.
 - b. John used to smoke.
 - c. John doesn't smoke.

Finally, there appears to be a difference between the alternatives of strong scalar items like *every* and soft triggers like *win* which is worth emphasizing: while the alternatives of strong scalar items appears to be symmetric, in that, for instance, *some* is an alternative of *every* and *every* is an alternative of *some*, the ones of soft triggers do not. In other words, I am assuming that *win* has *participate* as an alternative but not that *participate* has *win* as an alternative. This in turn predicts that we should not expect *participate* to behave like a weak scalar item, a prediction that is confirmed by the pattern of *win* and *participate* in certain disjunctions. In CHAPTERS 1 and 2, I discussed the so-called “Hurford’s constraint”, a felicity condition on the utterance of disjunctive sentences (Hurford 1974; see also Chierchia et al. To appear and Singh 2008c). Chierchia et al. (To appear) use Hurford’s constraint as a diagnostic for scalar implicatures, so given the present proposal, we can use it here to explore soft presuppositions. In particular, the present proposal expects soft triggers like *win* to behave like a strong scalar term like *all*. As (51a) and (52a) show this prediction is borne out: in both cases the second disjunct would entail the first, unless we analyze them as (51b) and (52b), which are equivalent to (51c) and (52c), respectively, with no entailment relation between the disjuncts.

- (51)
- a. Either John didn't do all of the readings or he didn't do any of them.
 - b. Either EXH[not[John did all of the readings] or not[he did any of the readings]
 - c. Either John did some but not all of the readings or he didn't do any.
- (52)
- a. Either John didn't win or he didn't participate.
 - b. Either EXH[not[John win] or not[he participate]
 - c. Either John participated and didn't win or he didn't participated.

On the other hand, given that we are not assuming that *participate* has any alternative, we do not expect expressions like *participate* to behave like (weak) scalar terms. This prediction again

is borne out. To see this, consider (53a) and (54): in both cases the second disjunct entails the first, however if we analyze (53a) as (53b), we predict the reading in (53c), with no entailment relation between the disjuncts. On the other hand, given that we are assuming that *participate* has no alternative, we cannot exhaustify the first disjunct and obtain an inference from the first disjunct of (54), thus the infelicity is expected.

- (53) a. Either John did some of all of the readings.
 b. Either EXH [John did some] or all of the readings.
 c. Either John did some but not all or all of the readings.

(54) #John participated or he won.

I turn now to a reminder on the theory of scalar implicatures that I am assuming outlined in CHAPTER 1.

3.3.2 Reminder on the theory of scalar implicatures

I adopt the theory of scalar implicatures as entailments of exhaustified sentences presented in CHAPTER 1. Recall the main ingredients are the following: first, an exhaustivity operator EXH projected in the syntax with the semantics in (55)

$$(55) \quad \llbracket \text{EXH}_{\mathcal{Alt}(p)} \rrbracket(p)(w) = p(w) \wedge \forall q \in \mathcal{Excl}(p) [\neg q(w)]$$

Second, a notion of excludable alternatives as all the alternatives that are in all maximal consistently excludable subsets of the alternatives.

$$(56) \quad \mathcal{Excl}_{ie}(\phi) \text{ is the intersection of all maximal consistently excludable subsets of } \mathcal{Alt}(\phi)$$

Third, the distribution of EXH is constrained by a version of the strongest meaning hypothesis. (see Chierchia et al. To appear and references therein).

- (57) **Do not weaken!:** Do not insert EXH in a sentence S if it leads to an equivalent or weaker meaning than S itself.

With these ingredients in place, let us now turn to the first predictions of this system.

3.3.3 First predictions

3.3.3.1 Negation

In the case of a soft trigger embedded under negation, we predict the apparent projection behavior observed by Chemla (2009a). When negation is applied to the alternatives, the entailment relations are reversed. As a result, exhaustification yields the negation of the negated alternatives and both a sentence and its negation yield the same inference. So for instance both (58a) and (59a) lead to the inference that John participated.

- (58) a. John won.
b. $\text{Alt} = \{\text{won}(j), \text{participated}(j)\}$
c. $\llbracket \text{EXH} \rrbracket [\text{won}(j)] = \text{won}(j)$
- (59) a. John didn't win.
b. $\text{Alt} = \{\neg \text{won}(j), \neg \text{participated}(j)\}$
c. $\llbracket \text{EXH} \rrbracket [\neg \text{won}(j)] = \neg \text{won}(j) \wedge \neg \neg \text{participated}(j) = \neg \text{won}(j) \wedge \text{participated}(j)$

3.3.3.2 Disjunctions and Conjunctions

In the case of a disjunction like (60a), the present proposal predicts nothing other than the conditional entailment in (60b).

- (60) a. John was not in good shape or he won the marathon.
b. If John was in good shape, he participated.

While (60b) appear intuitively correct in certain contexts, in others intuitively we would want to derive the stronger (61).

(61) John participated.

This is a well-known phenomenon in the literature, also known as the “proviso problem” (Geurts 1999) and there are various accounts in the literature, which derive the non-conditional inference in (61) from (or in addition to) the conditional one in (60b) (Perez-Carballo 2008, Singh 2008a, Franke 2010, van Rooij 2007 among many others). As Chemla (in preparation) points out, most of the solutions proposed are based on considerations about the plausibility that the speaker believes only the conditional inference, regardless of how this is derived in the first place. So adopting one of these solutions, we can also derive non-conditional inferences like (61) where needed. Notice that in other cases, like (62), we can derive the non-conditional inference in (61) directly with exhaustification.

(62) John didn’t win or he is upset for other reasons.

(61) is obtained because the alternative $\neg \text{participated}(j)$ in (64) is excludable and hence gets negated by EXH, thus giving rise to (61), as shown in (65).¹²

¹²Notice also that this case is an argument for the need of the notion of innocent exclusion (cf. CHAPTER 1). In particular, if we only were to exclude all alternatives that are not entailed by the assertion, we would negate $(\neg \text{participated}(j) \vee q)$. However, its negation entails $\neg q$ (i.e., that John is upset) which is not an inference of the disjunction in (62). However, this alternative is not innocently excludable: its exclusion together with the assertion entails the inclusion of another alternative, namely $\neg \text{win}(j)$. Notice also that the same problem arises with strong scalar terms like *every*, in cases like (63a), whose non-weaker alternative in (63b), if excluded, would lead to the not attested inference in (63c).

- (63) a. Mary is happy or not every student finished the exam.
b. Mary is happy or no student finished the exam.
c. Mary isn’t happy.

$$(64) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \neg \mathbf{win}(j) \vee q \\ q \\ \neg \mathbf{win}(j) \\ \neg \mathbf{par}(j) \\ \neg \mathbf{par}(j) \vee q \\ \neg \mathbf{win}(j) \wedge q \\ \neg \mathbf{par}(j) \wedge q \end{array} \right\}, \mathcal{Excl} = \left\{ \begin{array}{l} \neg \mathbf{par}(j) \\ \neg \mathbf{win}(j) \wedge q \\ \neg \mathbf{par}(j) \wedge q \end{array} \right\}$$

$$(65) \quad \llbracket \text{EXH} \rrbracket (\neg \mathbf{win}(j) \vee q) = (\neg \mathbf{win}(j) \vee q) \wedge \mathbf{par}(j) \wedge (\neg q \vee \mathbf{win}(j)) \wedge (\neg q \vee \mathbf{par}(j))$$

In the case of a conjunction like (66a) and (66b), we get the right inference in (66c) either by simple entailment or by inserting EXH globally or in one of the conjuncts.

- (66) a. John wasn't sick and won the race.
b. John was sick and he didn't win the race.
c. John participated.

To illustrate, we analyze (66b) as having the LF in (69). The alternatives are the ones in (70) and exhaustification gives rise to the inference in (66c), as shown in (71).¹³

¹³An issue connected in particular to conjunctive sentences is the one of asymmetry. In other words, why there is a contrast between (67a) and (67b), which only differ in terms of the position of the trigger.

- (67) a. John participated and won.
b. ??John won and participated.

As Chemla (in preparation) points out, however, the same contrast can be replicated with non-presuppositional sentences as in (68a) vs. (68b).

- (68) a. Daniel has a car and it is a Ferrari.
b. ?Daniel has a Ferrari and it is a car.

If the asymmetry comes from some independent mechanism, it can then be added to the theory proposed here. For instance, it could be linked to the distribution of EXH (Fox and Spector 2009). I leave a more detailed exploration of the asymmetry for further research; for discussion on asymmetry see (Schlenker 2008a, Chemla in preparation, Rothschild 2011, Chemla and Schlenker To appear for discussion).

(69) EXH[John was sick and not[he won the race]]

$$(70) \quad \mathcal{Alt} = \left\{ \begin{array}{l} q \wedge \neg \mathbf{win}(j) \\ q \\ \neg \mathbf{win}(j) \\ \neg \mathbf{par}(j) \\ q \wedge \neg \mathbf{par}(j) \\ q \vee \neg \mathbf{win}(j) \\ q \vee \neg \mathbf{par}(j) \end{array} \right\}, \quad \mathcal{Excl} = \left\{ \begin{array}{l} q \wedge \neg \mathbf{par}(j) \\ \neg \mathbf{par}(j) \end{array} \right\}$$

(71) $\llbracket \text{EXH} \rrbracket (q \wedge \neg \mathbf{win}(j)) = (q \wedge \neg \mathbf{win}(j)) \wedge \mathbf{par}(j)$

3.3.3.3 Conditionals

The case of a soft trigger embedded in the consequent like (72) is analogous to the corresponding case of disjunction in the preceding section: the conditional inference that if John wasn't sick he participated in the marathon is predicted as an entailment. In the same way as in the case of disjunction, we can rely on a solution to the proviso problem and obtain the non-conditional inference that he participated in the marathon.

(72) If John wasn't sick, he won the marathon.

Let us now look at the predictions of the present proposal for the case of a soft trigger embedded in the antecedent of a conditional, like (73a). The inference that we want to obtain, at least in some cases is (73b).

- (73) a. If Jane won, she is celebrating right now.
b. Jane participated.

I first show that we predict the weaker inference in (74) and then suggest two ways to strengthen (74) to (73b).

(74) It's possible that Jane participated.

Weak projection There are a number of possible analysis of conditionals on the market, so first we need to decide which one to adopt. One such analysis of conditionals is the material implication, $p \rightarrow q$, which states that a conditional is false only if the antecedent is true and the consequent is false. As I show now, this analysis can account for the cases of projection of soft presuppositions from antecedents of conditionals. However, it also make wrong predictions about the consequent. By way of illustration, consider the case in (75a), schematically represented in (75b).

- (75) a. If Jane won, she is celebrating right now.
 b. **won**(j) \rightarrow **cel**(j)
 c. $\text{Alt} = \left\{ \text{won}(j) \rightarrow \text{cel}(j), \text{par}(j) \rightarrow \text{cel}(j) \right\}$

When we exhaustify (75b) as in (76a), over its alternatives in (75c), we negate the non-weaker alternative **part** \rightarrow **cel**(j) and we obtain two inferences: first, given that the falsity of a conditional analyzed as material implication entails the truth of its antecedent, we obtain the inference that Jane participated. This could account for the apparent projection behavior of the presupposition of *Jane won* embedded in the the antecedent. Second, however, we also obtain the non-attested inference to the negation of the consequent, that is she isn't celebrating right now.

- (76) a. $\llbracket \text{EXH} \rrbracket (\text{won}(j) \rightarrow \text{cel}(j)) =$
 $(\text{won}(j) \rightarrow \text{cel}(j)) \wedge \neg(\text{par}(j) \rightarrow \text{cel}(j)) =$
 $(\text{won}(j) \rightarrow \text{cel}(j)) \wedge (\text{par}(j) \wedge \neg \text{cel}(j))$

Material implication combined with the theory of soft presuppositions given here gives rise to a problematic prediction. Notice, however, that since this prediction carries over to cases involving “regular” scalar implicatures, a solution for this problem is needed independently. Indeed for a case like (77a), involving the scalar term *all*, we obtain in the same way the prediction that

John corrected some of the assignment but also that he will not go out tonight. Again the latter is certainly not an attested inference of (77a).

- (77) a. If John corrected all of the assignments, he will go out tonight.
 b. John corrected some of the assignments and he won't go out tonight.

If we move to a different theory of conditionals, like strict implication, $\Box(p \rightarrow q)$, we do not make this incorrect prediction anymore: we only predict that it is possible that Jane participated and that she is not celebrating right now. This is illustrated in (78a)-(78d).

- (78) a. If Jane won, she is celebrating right now.
 b. $\Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)]$
 c. $\mathcal{Alt} = \left\{ \Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)], \Box[\mathbf{par}(j) \rightarrow \mathbf{cel}(j)] \right\}$
 d. $\llbracket \text{EXH} \rrbracket (\Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)]) =$
 $(\Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)]) \wedge (\neg \Box[\mathbf{par}(j) \rightarrow \mathbf{cel}(j)]) =$
 $(\Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)]) \wedge (\Diamond[\mathbf{par}(j) \wedge \neg \mathbf{cel}(j)])$

Furthermore, it is easy to see that (78d) is equivalent to the claim that it is possible that Jane participated and *did not win* and that she is not celebrating right now. This appears an attested inference for conditionals like (78a). Indeed, it is entailed by an inference that we generally draw from conditionals, the so-called “conditional perfection” inference, which in this case would be (79) (see von Stechow 2001 and references therein; see also CHAPTER 2, Appendix A).

- (79) $\Box[\neg \mathbf{win}(j) \rightarrow \neg \mathbf{cel}(j)]$

I come back to the inferences predicted in this non-upward entailing contexts like antecedent of conditionals in section 3.6, when I talk about the restrictors of universal sentences. Now let us discuss instead the issue that, while on one hand we solved the problem of the non-attested inference to the negation of the consequent, now the projection out of the antecedent is weakened: we only get that *it's possible* that Jane participated, which seems too weak, at least

in some cases. In the next paragraph, I sketch two possible ways to strengthen this inference to Jane participated.

Strong projection A first strategy to account for the strong inference in (80c) from (80a) in the present account would be to say that the prediction from a conditional like (80a) to the weak inference in (80b), is another instance of the proviso problem.

- (80) a. If Jane won, she is celebrating right now.
- b. It's possible that Jane participated.
- c. Jane participated.

In particular, Singh (2009) argues that we should analyze also cases like (81) and (82) as giving rise to another instances of the proviso problem and propose a way to derive the inferences from (81b) to (81c) and from (82b) to (82c).

- (81) a. John believes that Bill's brother will come.
 - b. John believes that Bill has a brother.
 - c. Bill has a brother.
-
- (82) a. It's possible that John won.
 - b. It's possible that John participated.
 - c. John participated.

It is conceivable, then, that the inference from (80b) to (80c) is of the same nature and should be solved by an account of the proviso problem, which accounts for the inference from (81b) to (81c) and from (82b) to (82c).

In Romoli 2011, I propose a different solution by postulating that conditionals also introduce their own alternatives. I adopted a strict conditional semantics of conditionals, with the (hard) presupposition that the antecedent must be compatible with the modal base (von Fintel 1999).

The proposal is that conditionals like (83a) are associated with the alternatives in (83b).¹⁴

- (83) a. $\llbracket \text{if } p, q \rrbracket$ is defined if $\Diamond p$
 when defined = $\Box[p \rightarrow q]$
 b. $\text{Alt} = \left\{ \Box[p \rightarrow q], \Diamond\neg p, \Diamond q, \Diamond\neg q \right\}$

One can show that in simple cases, where no scalar item appears in the antecedent, none of the three alternatives is excludable, hence exhaustification is predicted to be vacuous. On the other hand, if we go back to the crucial case involving a scalar item embedded in the antecedent, we end up with more alternatives. In these cases, with (84) as an example, exhaustification is no longer vacuous and we end up with the right prediction, namely that Jane participated.^{15,16}

- (86) a. If Jane won, she is celebrating right now
 b. $\text{Alt} = \left\{ \begin{array}{l} \Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)], \Box[\mathbf{par}(j) \rightarrow \mathbf{cel}(j)] \\ \Diamond\neg\mathbf{won}(j), \Diamond\neg\mathbf{par}(j), \Diamond\neg\mathbf{cel}(j), \Diamond\mathbf{cel}(j) \end{array} \right\}$
 c. $\llbracket \text{EXH} \rrbracket (\Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)]) = \Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)] \wedge \neg\Diamond\neg\mathbf{par}(j) =$

¹⁴Where these alternatives come from is left open in Romoli 2011. I leave this open here as well, noting that one direction for future exploration might be to observe that the alternatives of conditionals posited here are what they are generally thought as the clausal implicatures, minus the one that is missing, $\Diamond p$, which is already presupposed (cf. Gazdar 1979). The hope is that a theory of clausal implicatures will motivate independently the alternatives here.

¹⁵More precisely, we obtain that it is true that Jane participated in all worlds in the relevant modal base, which I take to be epistemic in these cases. I leave for further research to explore the predictions for cases of non-epistemic conditionals.

¹⁶Notice that at this point the present system predicts that also scalar implicatures coming from strong scalar items should “project” out of the antecedents of conditionals. In other words, it predicts that (84b) can be an inference of (84a).

- (84) a. If John failed all of his students, the dean will be upset.
 b. John failed some of his students.

It is unclear whether (84a) can ever have (84b) as an inference, but if it can, it is intuitively much weaker than the inference from (85a) to (85b), repeated from above. Below, when I discuss the differences between soft presuppositions and scalar implicatures I show that we can account for the difference between (84a) and (84b), on one hand, and (85a) and (85b) on the other, via the notion of obligatory scalar implicature.

- (85) a. If Jane won, she is celebrating right now
 b. Jane participated

$$\Box[\mathbf{won}(j) \rightarrow \mathbf{cel}(j)] \wedge \Box\mathbf{par}(j)$$

In the following, I tentatively adopt the second strategy from Romoli 2011 to account for the projection of soft presuppositions from the antecedents of conditionals and leave for further research the exploration of the first one based on an account of the proviso problem.

In the next section, I sketch the predictions for the case of polar questions and then I turn to the behavior of stacked soft triggers, which as discussed in CHAPTER 2 is problematic for Abusch's (2010) account, and show how the present proposal can straightforwardly predict their behavior.

3.3.3.4 Polar Questions

Let us go through a sketch on how to integrate the inference from (87a) to (87b) in the present account.

- (87) a. Did John win?
b. John participated.

First, assume a semantics for polar questions as denoting the pair of its positive and negative answers (Hamblin 1973 among many others). So for instance the question in (87a) denotes the set of propositions in (89).

$$(88) \quad \lambda p.p = \mathbf{win}(j) \vee p = \neg\mathbf{win}(j)$$

Second, we can define a version of EXH, call it EXH_q , as in (89), which applies to sets of propositions, by exhaustifying each member of the set (cf. Menendez Benito 2006).

$$(89) \quad \llbracket \text{EXH}_q \rrbracket (Q_{\langle s,t \rangle}) = \{\llbracket \text{EXH} \rrbracket [p] : p \in Q\}$$

Given these two assumptions, we predict the inference in (87b) from (87a). In particular, given the results about negation above, the result of exhaustifying (87a) is in (90).

$$(90) \quad \llbracket \text{EXH}_q \rrbracket(87a) = \lambda p.p = \text{EXH}[\mathbf{win}(j)] \vee \text{EXH}[\neg \mathbf{win}(j)] = \\ \lambda p.p = \mathbf{win}(j) \vee (\mathbf{par}(j) \wedge \neg \mathbf{win}(j))$$

Assuming that polar questions themselves introduce the felicity condition that one of the answers is true, then the proposition that John participated becomes an inference of the question itself.¹⁷ Notice that we predict the same possible inference in the case of other scalar terms embedded in a polar question. I argue that this is a good prediction: for instance, (91a) appears to give rise in some cases to the implication in (91b) (see Chemla (2008) for discussion).

- (91) a. Did John fail all of his students?
b. John failed some of his students.

3.3.3.5 Stacked soft triggers

We saw above that Abusch (2010) makes too weak predictions in the case of a soft trigger embedded under another. For instance, (92a) and (92b) give rise to the inference in (92c), but her system only predicts the weaker inference in (92d).

- (92) a. John stopped winning
b. John didn't stop winning
c. John used to win
d. John used to participate

The present proposal can, instead, account for this case too. The inference from (92a) to (92c) is not a problem given that the latter is an entailment of the former. The inference from (92b) to (92c), instead, can be obtained by exhaustifying the combination of alternatives as in (93b).

- (93) a. $\neg \mathbf{stop}(\mathbf{win}(j))$

¹⁷Here I remain neutral on how to derive this condition. Although Abusch (2010) does not discuss polar questions, one advantage of her system over the present one, is that it can predict this inference as arising from the disjunctive closure of the alternatives of the question.

$$\text{b. } \text{Alt}(93\text{a}) = \left\{ \begin{array}{l} \neg \text{stop}(\text{win}(j)), \neg \text{stop}(\text{par}(j)) \\ \neg \text{used-to}(\text{win}(j)), \neg \text{used-to}(\text{par}(j)) \end{array} \right\}$$

When we exhaustify (93a) with respect to the alternatives in (93b) we negate in particular the alternative $\neg \text{used-to}_j(\text{win})$, which is not entailed by the assertion in (93a), and we obtain the inference that John used to win.

$$(94) \quad \llbracket \text{EXH} \rrbracket [\neg \text{stop}(\text{win}(j))] = \\ \neg \text{stop}(\text{win})(j) \wedge \text{used-to}(\text{win}(j)) \wedge \text{used-to}(\text{par}(j))$$

This works with the simplified notion of excludable alternatives given in (39). It can be shown, however, that once we turn to a more sophisticated notion of excludable alternatives (cf. fn. 19), the alternative **used-to(win)** cannot be excluded anymore and thus we only obtain the weaker inference that John used to participate.¹⁸ We can, nonetheless, account of this inference by exploiting the embeddability of the exhaustivity operator and analyze (92b) as (95).¹⁹

$$(95) \quad \text{EXH}[\text{not}[\text{stop}[\text{EXH}[\text{PRO winning}]]]]$$

The exhaustification of the embedded clause is just vacuous, because *win* is the strongest member of its alternatives, represented in (96). However, it crucially “eats up” the alternatives of *win*, so that the matrix exhaustification just operates on the alternatives of *stop* in (97b).

$$(96) \quad \text{a. } \llbracket \text{EXH} \rrbracket (\text{win}(j)) \\ \text{b. } \text{Alt}(96\text{a}) = \left\{ \begin{array}{l} \text{win}(j) \\ \text{participate}(j) \end{array} \right\}$$

$$(97) \quad \text{a. } \llbracket \text{EXH} \rrbracket (\neg \text{stop}(\text{win}(j)))$$

¹⁸Thanks to Irene Heim (p.c.) for discussion on this point.

¹⁹I have defined EXH as a propositional operator, therefore it is convenient to analyze the clausal argument of *stop* as a proposition. However, this is just for convenience, if one wants the argument of *stop* to be a property, it is easy to generalize EXH to any type “that ends in *t*” (see also Magri 2011b).

$$\text{b. } \text{Alt}(97\text{a}) = \left\{ \begin{array}{l} \neg \text{stop}(\text{win}(j)) \\ \neg \text{used-to}(\text{win}(j)) \end{array} \right\}$$

At this point, the matrix exhaustification in (97a) is just like the simple case of negation that we saw above: we obtain the inference that John used to win, by negating the stronger alternative that he didn't used to win.²⁰

Summing up, the account sketched above can account for the apparent projection behavior of soft presuppositions under negation and other embeddings like the antecedents of conditionals. Furthermore, it does not run into a problem in the case of a soft trigger embedded into another. I turn now to the differences between soft presuppositions and scalar implicatures on one hand and hard presuppositions on the other.

3.4 Soft versus hard triggers and soft triggers versus strong scalar terms

The differences between soft and hard triggers depend on the theory assumed for the latter. For our purposes, we do not need to decide on a specific theory, in order to account for the differences between soft and hard triggers. It is enough that we assume a theory that predicts universal projection for the presupposition of hard triggers embedded under quantificational sentences.²¹

²⁰Abusch (p.c. to Sauerland) suggests a similar solution by proposing that her pragmatic principle of disjunctive closure should apply every time a soft trigger is encountered. This would ensure that there would never be a combination of the alternatives of soft triggers. However, given the assumption that the alternatives of soft triggers grow compositionally, the same problem would arise with other alternative bearers like scalar terms. For instance, in the case of (98a) the predicted inference is only (98b) and not the intuitively correct (98c).

- (98) a. (Now that he is retired), John didn't stop meeting all the students
 b. John used to meet some of the students
 c. John used to meet all of the students

In her system, one would have to add a constraint on alternative construction so that the alternative of soft triggers and the ones of other scalar terms do not mix. In the present account, however, they are allowed and expected to combine and, in fact, this combination is at the basis of the account of some puzzles regarding the interaction between soft triggers embedding other scalar terms (see Author 2011 and Chemla in preparation).

²¹See Schlenker 2008c for a discussion of different recent theories of presuppositions and their predictions.

Furthermore, we also predict the difference between soft and hard presuppositions in terms of suspendability, simply by assuming that if there is a way to cancel hard presuppositions, it is more marked than the mechanism of suspending soft presuppositions, which I discuss below.²²

The differences between soft triggers and “regular” strong scalar terms to be accounted for are the following: under negation they behave in the same way, in that they both appear to project systematically, as shown for instance by the inference from (102a) to (102b) and from (103a) to (103b).

(102) a. Mary didn’t win.

b. Mary participated.

(103) a. Mary didn’t meet all of the students.

²²There is a further property generally assumed to be a characteristic of presuppositions, which is a peculiar discourse status: presuppositions are generally felt to be taken for granted in the context at the moment of utterance of the presupposing sentence. This is captured in the approach initiated by Stalnaker (1974), by a requirement that presuppositions should be entailed in the context at the moment of utterance of the presupposing sentence. Notice, however, that while this appears correct for the case of hard presuppositions, it is unclear to me that this should also apply to soft presuppositions. In a context in which it is not known whether John participated or not, we can nonetheless utter (99).

(99) John didn’t win the race

The response from the stalnakerian approach is that there is a process of accommodation of presuppositions. However, one could instead say that there is no condition that requires soft presuppositions to be contextually entailed; they just can happen to be. Here I am saying that soft presuppositions are inferences and when they happen to be contextually entailed already, then we do not exhaustify vacuously (this could be traced back to the **do not weaken** condition). On the other hand, if they are not contextually entailed, whereas in the stalnakerian approach we would resort to accommodation, here we just exhaustify and get the inference.

Finally, notice that the “hey wait a minute test”, generally used as a diagnostic for the discourse status of presuppositions, applies to soft presuppositions, as (100) shows (von Stechow 2008).

(100) a. John stopped smoking.

b. Hey wait a minute! I didn’t even know that he used to smoke.

However, the hey wait a minute test is problematic as a test for presuppositions. This is because it seems to be applicable also to entailments (thanks to Danny Fox (p.c.) for pointing this out to me). Consider (101a) and (101b) below, where we are talking about John who is currently on a trip from Rio to New York.

(101) a. John is in Miami.

b. Hey wait a minute, I didn’t even know he left Brazil already .

In sum, if we can use this test with entailments as in (101b), we cannot rely on this test to decide whether something is a presupposition or not.

- b. Mary met some of the students.

In other embeddings, like the antecedent of conditionals, soft presuppositions typically project out, while scalar implicatures do not or do so very weakly. While (104b) is definitely an inference of (104a), unless it is contradicted in the context, it is not clear that (105b) is an inference of (105a).

- (104) a. If Mary won, she will be very happy.
b. Jane participated.

- (105) a. If all of the students came, Jane is happy.
b. Some of the students came.

Another important difference is the projection from the scope of negative quantifiers. While I argue that the inference from (107a) to (107b) is possible, this is intuitively less robust than the inference from (106a) to (106b), as also experimentally shown by Chemla (2009b).

- (106) a. No student discovered that he was accepted.
b. Every student was accepted.
- (107) a. No student did all of the readings.
b. Every student did some of the readings.

I argue that soft triggers are strong scalar terms, and the their differences from other strong scalar terms can be traced back to the fact that the former give rise to obligatory scalar implicatures, in a sense to be specified below, while the latter do not. In the following, I first discuss how the grammatical approach adopted here accounts for the suspension of scalar implicatures and then I show how we can account for the suspension of soft presuppositions in a way that accounts for the differences between the two.

3.4.1 Suspension of Scalar Implicatures

In CHAPTER 1, I outlined how the theory of scalar implicatures that I adopt can account for the suspension of scalar implicatures. In particular, the account is based on two components: one morphosyntactic and one pragmatic. The morphosyntactic component is the assumption that scalar terms bear a feature σ , which is valued “+” or “-”, depending on whether the alternatives are active or not. If the alternatives are active, $[+\sigma]$ forces the scalar term to enter in agreement relation with a c-commanding exhaustivity operator.²³

(109) EXH[...*scalar term*_[$+\sigma$]]

If the alternatives are not active, no exhaustification occurs.

(110) [...*scalar term*_[$-\sigma$]]

The choice between (109) and (110) is a matter of structural ambiguity analogous to a sentence like (111), which can be analyzed with an LF in which the prepositional phrase attaches to the verb phrase or one in which it attaches to the noun phrase.

(111) Mary shot the soldier with a gun.

In addition to the grammatical feature mechanism, I also assumed a pragmatic mechanism of relevance. In CHAPTER 1, I adopted the notion of relevance in (112) based on the notion of question under discussions. The definition in (112) says that a proposition is relevant if and only if it doesn’t distinguish among the cells (of the partition) of the question under discussion. In other words, it is relevant if and only if it does not provide irrelevant information.

²³The notion of c-command adopted here is in (108).

(108) A **c-command** B if A doesn’t dominate B and the first relevant branching node that dominates A dominates B.

- (112) **Relevance** A proposition p is relevant to a question Q iff p is equivalent to the union of some subset of Q .

In sum, I am assuming a grammatical feature-based mechanism according to which each scalar term is ambiguous between a version that needs to agree with an exhaustivity operator and one that does not. Furthermore, I am assuming a pragmatic mechanism that reduces alternatives depending on the question under discussion. I will not provide a detailed implementation of how to integrate these two mechanisms here. As discussed in CHAPTER 1, for our purposes it is sufficient to assume the following constraints on their interaction: when the grammatical mechanism allows an ambiguity between scalar terms, then the alternatives are subject to relevance. When instead the grammatical mechanism gives us no choice between active and non-active forms, then relevance plays no role (see also Chierchia to appear for a similar idea).

Given this notions of (de)activation of alternatives and relevance, let us now go through how we can account for the differences between scalar implicatures and soft presuppositions.

3.4.2 Suspension of scalar implicatures vs. suspension of soft presuppositions

Returning to the difference in defeasibility between soft triggers and strong scalar terms, I argue that we can account for this phenomenon if we take into account the varying availability of the activated alternatives. The feature-based implementation, adopted from Chierchia (2006, to appear), provides us with the option of having the alternatives of certain elements obligatorily active. I propose that soft triggers are such elements. The way to capture this is by assuming that soft triggers are endowed with the feature $[\sigma]$, which is, however, necessarily valued as “+”. As a consequence, the alternatives of soft triggers are always active and require exhaustification. Furthermore, I am assuming that when alternatives are always active, the question under discussion plays no role. In other words, the alternatives of strong scalar terms are subject to

relevance while the ones of soft triggers are not.^{24,25}

Taking the alternatives of soft triggers to be obligatory predicts *prima facie* that their presuppositions should never be suspendable. However, we observed earlier that this is not always the case. If we want to maintain that alternatives are always active and yet that they don't always give rise to presuppositions, we need to appeal to a different source for this suspendability. I argue that the difference source of suspension is the scope of EXH. This is because in the case of strong scalar items local exhaustification is always vacuous and thus represent a way of suspending their inference. To illustrate consider (113).

(113) If Mary won, she is celebrating.

Given the hypothesis above, the alternatives of *win* are always active, exhaustification always occurs and there are in principle two sites at which this can happen: at the global level as in (114a), or within the antecedent of the conditional as in (114b).

- (114) a. EXH[if Mary won_[+σ] she is celebrating]
b. [If [EXH[Mary won_[+σ]] she is celebrating]

(114a) gives rise to the soft presupposition that Mary participated in the way proposed in section 3.3.2. (114b), on the other hand, does not give rise to any inference, since the exhaustification of the embedded complement is vacuous.²⁶ Notice that given the principle **do not weaken!** in

²⁴Simons et al. (2010) propose a theory of the projection of presuppositions (and other inferences) which is also connected to the notion of questions under discussions. Roughly, they propose that presuppositions project when they are not at issue relative to the question under discussion. I leave the comparison between the present account and theirs for further research. See Abrusán 2011a for detailed criticism of their proposal.

²⁵Notice that, as an anonymous reviewer points out, a prediction of this feature-based account is that there might be languages in which strong scalar terms like *every* would only have a [+σ], while soft triggers could have [+σ] or [−σ], thus we expect their behavior to change accordingly.

²⁶To see this notice that exhaustification at that scope site is like exhaustifying the unembedded sentence in (115a), with respect to the alternatives in (115b).

- (115) Mary won.
(115) {Mary won, Mary participated}

(57), (114b) is dispreferred, as it is equivalent to the meaning without EXH. The inference that Mary participated is, then, predicted to be the default unless we make it clear in the context that it should be suspended; more precisely, we do not insert exhaustification locally unless information in the context contradicts the result of global exhaustification, like in (116).

(116) I don't know whether Mary ended up participating, but if she won, she is celebrating.

In sum, contrary to scalar implicatures which can be suspended by virtue of there not being active alternatives to exhaustify, soft presuppositions can only be suspended via local exhaustification.²⁷ Let us now go through to how this mechanism can account for the differences between scalar implicatures and soft presuppositions.

I proposed above that scalar implicatures are subject to relevance while soft presuppositions are not. I argue now that it is precisely this difference that gives rise to the different behavior that they exhibit. Consider the case of negation first, where we saw that both scalar implicatures and soft presuppositions seem to project robustly. A possible question under discussion for a sentence like (118a) appears to be (119a), which corresponds to the partition in (119b), which divides the logical space in a cell in which John did all of the readings, one in which John did some but not all of the readings, and one in which John didn't do any of the readings.

- (118) a. John didn't do all of the readings
 b. $\{\neg[\text{John did all}], \neg[\text{John did some}]\}$
- (119) a. How much of the readings didn't John do?
 b. $\{c_1 = \text{all}, c_2 = \neg\text{all} \wedge \text{some}, c_3 = \neg\text{some}\}$

²⁷Notice that in principle also scalar implicatures coming from strong scalar items could be suspended via local exhaustification: in fact, in principle the scalar implicature of (117a) could be suspended as in (117b) but also as in (117c). This creates a redundancy in the system; I come back to this below.

- (117) a. John didn't do all of the readings
 b. $\neg[\text{John did all}_{[-\sigma]} \text{ of the readings}]$
 c. $\neg[\text{EXH}[\text{John did all}_{[+\sigma]} \text{ of the readings}]]$

Both the alternatives in (118b) correspond to a cell or a union of cell in (119b), hence they are both relevant.²⁸ When we then exhaustify (118a), we obtain the inference that John did some of the readings.

Consider, instead, what happens in somewhat more complex cases involving scalar terms embedded under the antecedent of a conditional like (120a) or (120b). The question here is whether we predict the inference in (120c).

- (120) a. If John did all of the readings, he will go out tonight.
 b. John will go out tonight, if he did all of the readings.
 c. John did some of the readings.

Natural questions under discussion for (119a) and (119b) are (122a) and (122b), respectively.²⁹

- (121) a. What will John do if he did all of the readings?
 b. Under what conditions will John go out?

It can be shown that in both of these cases the alternatives that would give rise to the inference in (120c) are not relevant. By way of illustration, consider the case of (121b) Recall that the alternatives assumed above for cases like (120a) or (120b) are the ones in (122).

$$(122) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \Box[\mathbf{all} \rightarrow \mathbf{go-out}(j)], \Box[\mathbf{some} \rightarrow \mathbf{go-out}(j)] \\ \Diamond\neg\mathbf{all}, \Diamond\neg\mathbf{some}, \Diamond\neg\mathbf{go-out}(j), \Diamond\mathbf{go-out}(j) \end{array} \right\}$$

The partition corresponding to (121b) is in (123), where p and q are propositions that represent possible conditions under which John will go out. It is easy to see that $\Diamond\neg\mathbf{some}$ does not correspond to any cell or union of cells of (123) and it is then irrelevant.

- (123) $\{c_1 = \mathbf{go-out}(j) \text{ if and only if } p, c_2 = \mathbf{go-out}(j) \text{ if and only if } q, \dots\}$

²⁸Namely $\neg[\text{John did some}]$ corresponds to c_3 , while $\neg[\text{John did all}]$ corresponds to $c_2 \cup c_3$

²⁹See von Stechow (1994) for discussion.

Therefore, in the case of scalar terms embedded in the antecedents of conditionals like (120b) or (120a), given reasonable questions under discussion, the alternatives that would give rise to the inference in (120c) are not going to be relevant. This is the reason why (120c) is not predicted as an inference from (120a) and (120b).

In sum, we can account for the suspendability difference between scalar implicatures and soft presuppositions by postulating a difference in terms of their being subject to relevance or not, as modeled with the obligatoriness of activation of the alternatives.

3.5 Novel Predictions for Projection in Quantificational Sentences

As Chemla (2009a) points out, one motivation for the scalar approach to presuppositions is that it makes fine-grained predictions for quantificational sentences, which map nicely to Chemla's (2009b) empirical results. In particular, as shown below, it predicts that the projection in quantificational sentences should be sensitive to the type of determiner involved in the sentence. The present proposals makes three novel contributions with respect to quantificational sentences: first, by being restricted to soft presuppositions, together with any theory of hard presuppositions which predicts that they project universally, it can account for the differences between triggers observed by Charlow (2009). Second, by assuming independently justified alternatives for negative quantifiers, it correctly predicts both universal projection from the scopes of negative quantifiers and non-universal projection from their restrictors, a combination of predictions that is not made by any account that I am aware of. Furthermore, these new alternatives also predict universal inferences like (124b) for strong scalar terms embedded in the scope of negative quantifiers like *all* in (124a).

- (124) a. None of these professors failed all of their students.
 b. All of these professors failed some of their students.

Finally, given the differences in obligatoriness of alternatives, it can also account for the difference in robustness between the inference from (124a) to (124b) and the corresponding cases

involving soft presuppositions like (125a) and (125b).

- (125) a. None of these students won.
 b. All of these students participated.

3.5.1 The Empirical Landscape

The main result reported in Chemla 2009b is that the predictions for quantificational sentences appear to depend on the quantifier involved. In particular, strong universal inferences are obtained when presuppositional triggers are embedded in the scope of universal or negative-existential quantifier sentences. A further result is that in the case of a trigger appearing in the restrictor no evidence for universal projection is found with any quantifier. The following examples, adapted from Charlow 2009, illustrate and summarize these facts about nuclear scopes, (126)-(128), and restrictors, (129).

- (126) a. Each of these ten students stopped smoking.
 b. \leadsto Each of these ten students used to smoke.
- (127) a. None of these ten students stopped smoking.
 b. \leadsto Each of these ten student used to smoke.
- (128) a. Some/at least 5/less than 5 of these ten students stopped smoking.
 b. \nrightarrow Each of these ten students used to smoke.
- (129) a. Of these ten students, none/two of the ones who stopped smoking ate.
 b. \nrightarrow Each of these ten students stopped smoking.

As we saw above, Chemla (2009a) points out that the scalar approach correctly predicts universal inferences for universal sentences and non-universal inferences for cases like (128a). However, he claims that this approach makes the wrong prediction for the case of negative quantifiers, in that it would predict an existential inference, rather than a universal one, in cases like (127a). In the following I show that given independently motivated alternatives for nega-

tive quantifiers we, in fact, predict the universal inference in (127a), while also predicting the non-universal inference from the restrictor like in (129a).

Chemla (2009b) made use in his experiments of triggers that are generally claimed to be soft: possessives, factives and change of state predicates.³⁰ Charlow (2009) points out that there appears to be a difference between the triggers that Chemla used (*know*, *stop*, and possessives) and strong ones like *too*, *also*. He argues that the latter, but not the former, project uniformly across all quantifiers. Some of the examples he uses are the following in (77a), which would all have the inference in (131).

- (130) a. None of these 100 students [smokes [Marlboros]_F too] at recess.
 b. Some of these 100 students [also smokes [Marlboros]_F]
 c. (At least) two of these 100 students [smoke [Marlboros]_F too] at recess.
 d. Of these 100 students,
 none of the ones who [also smoke [Marlboros]_F] are blonde.
 e. Of these 100 students,
 two of the ones who [also smoke [Marlboros]_F] are blonde.

- (131) Each of these 100 students smokes something other than Marlboro.

As Charlow (2009) points out this is problematic for all theories in the literature. In particular, it is problematic for those approaches that can instead account very well for the non-universal projection of the cases seen above, as nothing in their theory distinguishes between these cases.³¹ The predictions of the present proposal, instead, fits naturally with this pattern. In fact, as it is supposed to apply only to soft triggers and assuming a theory of hard presuppositions which predicts universal projection, we expect a difference in projection between these two classes of triggers.

³⁰The status of possessives is actually unclear in this respect; see footnote 3 above.

³¹In particular it is problematic for Chemla in preparation, Fox (2008) and George (2008). Fox (2012b) proposes a new trivalent approach, which can account for the differences between triggers in projection, however it does not account for the different projection of soft presuppositions from the restrictor and the scope of negative quantifiers. I leave a detailed comparison with his proposal for future research.

3.5.2 The Predictions

3.5.2.1 Projection from nuclear scopes

The general predictions are the ones already pointed out by Chemla (2009a) and they are in line with his experimental results, apart from negative quantifiers, to which I return below. In the following, a few examples illustrate the pattern of predictions. In the case of upward entailing quantifiers, simple entailments derive the relevant inferences, whereas for downward entailing and non-monotonic quantifiers the contribution of exhaustification and its scope are crucial. Upward entailing quantifiers like *each* and *more than three* simply entail their alternatives, thus the relevant inferences are plain entailments.

- (132) a. Each student won.
 b. Each student participated.
- (133) a. More than 3 students won.
 b. More than 3 students participated.

Turning now to cases of downward entailing quantifiers like *no*, I propose to account for the projection behavior by claiming that the alternatives of *no* should include *not every*. This is motivated independently on the following grounds: first, notice that it is generally assumed that negative quantifiers like *no* and negated universals like *not every* are alternatives (Horn (1972), Levinson (2000)). This is because, as seen above, this can predict the inference from (134a) to (134b) as a scalar implicature.

- (134) a. Not every student came.
 b. Some student came.

(134a) shows that in order to derive the inference in (134b) we need to assume "no" is an alternative of "not every". But by the standard assumption that the alternatives of scalar implicatures are symmetric, we also have that *not every* is an alternative of *no*. Second, there are vari-

ous independent arguments for decomposing negative quantifiers as negation plus an indefinite (see Sauerland 2000, Penka 2007, Iatridou and Sichel 2008 among many others). Assuming the decomposition of *no* as *not some*, given any standard definition of how alternatives grow (Sauerland 2004) and the assumption that *every* and *some* are scale-mates, we straightforwardly predict that *no* (=not some) should have the alternative *not every*. Given these new alternatives, we can go back to the case of negative quantifiers and we can now replace *no* with *not every* in the alternatives. For instance, now for a sentence like (135a), we have the alternatives in (136).

(135) a. No student won.

b. $\neg\exists x[\mathbf{st}(x) \wedge \mathbf{won}(x)]$

$$(136) \quad \mathcal{Alt}(135) = \left\{ \begin{array}{l} \neg\exists x[\mathbf{st}(x) \wedge \mathbf{won}(x)], \neg\exists x[\mathbf{st}(x) \wedge \mathbf{part}(x)] \\ \neg\forall x[\mathbf{st}(x) \rightarrow \mathbf{won}(x)], \neg\forall x[\mathbf{st}(x) \rightarrow \mathbf{part}(x)] \end{array} \right\}$$

When we exhaustify (135a) with respect to (136), $\neg\forall x[\mathbf{st}(x) \rightarrow \mathbf{part}(x)]$ is excludable, thus we obtain the universal inference that every student participated.

$$(137) \quad \llbracket \text{EXH} \rrbracket (\neg\exists x[\mathbf{st}(x) \wedge \mathbf{won}(x)]) = \neg\exists x[\mathbf{st}(x) \wedge \mathbf{won}(x)] \wedge \forall x[\mathbf{st}(x) \rightarrow \mathbf{part}(x)]$$

The prediction for negative existentials like *no* is a universal projection, in line with Chemla's (2009b) findings, where the universal inference was robustly accepted in this context with soft triggers. Furthermore, as I argued above, despite the fact that the acceptance of the corresponding inference for scalar implicatures was much lower in the results of Chemla (2009b), universal inferences also arise in scalar implicature cases like (138a) (cf. fn. 12).

(138) a. None of these ten professors failed all of his students.

b. \rightsquigarrow All of these ten professors failed some of his students.

Finally, the approach discussed here also predicts a difference in robustness between the inference in (138b) from (138a) and the one of from (139a) to (139b).

- (139) a. No student won
b. Every student participated

Recall that I am assuming that the alternatives of a soft trigger like *win* are always active, while those of a strong scalar items like *all* to be subject to relevance. Under this analysis, we can predict that the inference from (138a) to (138b) can only be cancelled with local exhaustification, as in (140). As we know from above, this is a dispreferred option so it is going to be chosen only if information in the context contradicts the universal inference we would obtain with global exhaustification. An example of this case is in (141).

- (140) No [student] λx [EXH[x won]]

- (141) I don't know whether each of the students participated, but none of them won.

On the other hand, since the alternatives of scalar implicatures are optional, the inference from (138a) to (138b) can be suspended simply by deactivation of the alternatives of *all*, as in (142). Given that this option does not violate **do not weaken!**, it can be done without any special information in the context.

- (142) a. None of these professors failed $\text{all}_{[-\sigma]}$ of his students

In sum, we predict the possibility of universal projection for strong scalar term from the scope of negative quantifiers and we also predict the difference between soft triggers and other strong scalar terms in this respect. I turn now to the predictions for the case of the restrictors.

3.5.2.2 Projection out of restrictors

As mentioned above, the experimental data in Chemla (2009b) for the cases of the restrictors show a weaker acceptance of universal inferences for all quantifiers. The predictions of the present account here are in line with this result. Importantly, non-universal inferences are predicted both for the restrictors and the scope of *no* and *every*. Let me sketch both cases below.

In the case of the universal quantifier, a non-universal inference, analogous to the one we obtained above for the antecedent of conditionals, is predicted.

- (143) a. Every student who won will celebrate.
b. There is at least a student who participated but did not win and will not celebrate.

$$(144) \quad \text{EXH}(\forall x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \rightarrow \mathbf{celeb}(x)]) = \\
\forall x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \rightarrow \mathbf{celeb}(x)] \wedge \neg \forall x[(\mathbf{stud}(x) \wedge \mathbf{part}(x)) \rightarrow \mathbf{celeb}(x)] = \\
\forall x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \rightarrow \mathbf{celeb}(x)] \wedge \exists x[(\mathbf{stud}(x) \wedge \mathbf{part}(x)) \wedge \neg \mathbf{celeb}(x)]$$

If the first conjunct is verified all students that won will celebrate. So if some students participated and did not celebrate, it must be a student that did not win, for the whole conjunction to be true. So we predict the inference in (143b) and more generally we predict that soft presuppositions do not project universally out of the restrictor of universal sentences.

The account here also makes the right predictions for the case of *no*. In fact, it predicts that (145a) only gives rise to the non-universal inference in (145b).

- (145) a. None of the students who won were upset.
b. There is at least a student who participated but didn't win and was upset.

To see this, consider the schematic version of (145a) in (146).

$$(146) \quad \text{EXH}(\neg \exists x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \wedge \mathbf{upset}(x)]) \\
(147) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \neg \exists x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \wedge \mathbf{upset}(x)] \\ \neg \exists x[(\mathbf{stud}(x) \wedge \mathbf{part}(x)) \wedge \mathbf{upset}(x)] \\ \neg \forall x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \rightarrow \mathbf{upset}(x)] \\ \neg \forall x[(\mathbf{stud}(x) \wedge \mathbf{part}(x)) \rightarrow \mathbf{upset}(x)] \end{array} \right\}$$

Notice that crucially the only excludable alternative is (148).³² Hence we derive the non-

³²The alternative $\neg \forall x[(\mathbf{stud}(x) \wedge \mathbf{part}(x)) \rightarrow \mathbf{upset}(x)]$ is entailed by the assertion, hence it cannot be excluded: if none of the students who won were upset, then it must be the case that not all of the students who participated was

universal inference in (149): there is some student who participated and was upset. This is provably equivalent to (150): there is some student who participated but did not win and was upset.

$$(148) \quad \mathcal{E}_{xcl} = \{\neg\exists x[(\mathbf{stud}(x) \wedge \mathbf{part}(x)) \wedge \mathbf{upset}(x)]\}$$

$$(149) \quad \text{EXH}(\neg\exists x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \wedge \mathbf{upset}(x)]) = \\ \neg\exists x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \wedge \mathbf{upset}(x)] \wedge \exists x[\mathbf{stud}(x) \wedge \mathbf{part}(x) \wedge \mathbf{upset}(x)]$$

$$(150) \quad \neg\exists x[(\mathbf{stud}(x) \wedge \mathbf{won}(x)) \wedge \mathbf{upset}(x)] \wedge \exists x[\mathbf{stud}(x) \wedge \mathbf{part}(x) \wedge \neg\mathbf{win}(x) \wedge \mathbf{upset}(x)]$$

Summing up, the alternatives of negative quantifiers proposed here allow us to make predictions about projection of soft presuppositions from their restrictors and their scope, which are completely in line with the experimental evidence in Chemla (2009b).

3.5.3 Summary of Quantifiers

As discussed above, the pattern of projection of soft presuppositions in quantificational sentences, which emerges from the results in Chemla 2009b are: (a) the projection appears to depend on the quantifier involved, (b) the projection depends on whether the trigger is embedded in the scope or in the restrictor of the quantifier. The present theory can derive both of these results. Also, by being restricted to a theory of soft presuppositions, the present proposal predicts the differences between soft and hard presuppositions observed by Charlow (2009).

3.6 Conclusion

In this chapter, I proposed a development of Chemla's (2009a) idea that presuppositions are actually plain entailments in some cases and scalar implicatures in others, by restricting it to a theory of soft presuppositions, along the lines of what proposed in Abusch 2010. I showed that this can explain how soft presuppositions can be suspended, while also accounting for the

upset.

apparent projection behavior when they are not, without the assumptions and the problems of Abusch's (2010) system discussed above. Furthermore, I showed how the proposal can be connected to Abrusán's (2011a) account of the triggering problem for soft triggers, by modifying it slightly as to become a theory of how their alternatives, rather than presuppositions, come about. The two main contributions of the proposal presented in this chapter are: (a) an account of how soft presuppositions are similar and different from hard presuppositions on one hand and scalar implicatures on the other based on the notion of obligatoriness of scalar implicatures (Chierchia 2004, to appear, Spector 2007a, Magri 2010a) and (b) an account of the projection behavior of soft presuppositions both from the scope and the restrictors of quantificational sentences, in line with the experimental results reported in Chemla 2009b. In CHAPTER 4, I turn to two other contributions of the system proposed here with respect to the intervention effects by soft presuppositions in the licensing of NPIs and some puzzling cases of the interaction between soft presuppositions and "regular" scalar implicatures. In Appendix A, I discuss the connection between the the scalar-implicature account of neg-raising proposed in CHAPTER 2, and the theory of soft presuppositions proposed here.

3.7 Appendix: the differences between neg-raising inferences and soft presuppositions

In this chapter, I argued that soft triggers are scalar implicatures of sort, while in CHAPTER 2, I defended a scalar-implicature based account of neg-raising inferences, based on the argument that they are different from soft presuppositions. The question at this point is: am I not in the same footing as Gajewski (2007)? In other words, instead of saying that they are both presuppositions I am saying now that they are both scalar implicatures. Shouldn't we expect no difference in the same way as Gajewski (2007) does? The answer is no, because the scalar implicature-approach that I adopted allows us to make a distinction between the two inferences based on the notion of obligatoriness of alternatives. I proposed that the difference in defeasibility between soft presuppositions and scalar implicatures should be traced back to a difference

with respect to the (non)-obligatoriness of the activation of their alternatives. I argue that this is also the difference between soft presuppositions and neg-raising inferences. In fact, I am arguing for the following typology: regular scalar implicatures (e.g., scalar implicatures coming from scalar term like *every*) and neg-raising inferences are optional scalar implicatures, subject to relevance and with all properties generally attributed to scalar implicatures. Soft presuppositions are obligatory scalar implicatures: they are not subject to relevance, although they can be suspended, if they are in contradiction with information in the context. Finally hard presuppositions are real presuppositions, and this can account for the differences between soft and hard presuppositions.

Let us now go through the differences between neg-raising inferences and soft presuppositions in a little more detail. Before that it is worth pointing out that while the theory of soft presuppositions and the one of neg-raising that I am proposing are naturally connected, as one can be seen as the extension of the other, they are independent: one could adopt one without adopting the other, that is one could adopt the analysis of neg-raising as a scalar implicature but think that soft triggers should be treated as regular presuppositions and find a different way to account for the differences with hard-ones (see fn. 25 above).

Recall that the pattern that we want to account for is the following: scalar implicatures and neg-raising inferences are generally drawn when the corresponding scalar terms and neg-raising predicates are embedded under negation, but are not in the case of other embeddings like the antecedent of conditionals. Soft presuppositions, on the other hand, are systematically drawn when the corresponding soft trigger is embedded under negation and in other embeddings, unless they are suspended by conflicting information in the context. As argued in this chapter, I propose to account for this difference in terms of relevance and the (non)-obligatoriness of alternatives. This can be straightforwardly extended to neg-raising inferences. We saw in CHAPTER 2 that for a case like (151a), given a question under discussion like (152a), the alternative in (151b) is relevant and thus its exclusion gives rise to (151c).

(151) a. Bill doesn't think that Fred left.

- b. Bill doesn't have an opinion as to whether Fred left.
- c. Bill thinks that Fred didn't leave.

(152) What does Bill think about whether Fred left?

In the case of other embeddings like the antecedents of conditionals, however, the most natural questions under discussions are not going to include the alternatives that in turn would give rise to the neg-raising inference. We saw in this chapter that in a case like (153), the most natural questions under discussion is going to be along the lines of (154).

(153) John will take an umbrella, if he thinks that it's raining

(154) Under what conditions will John take an umbrella?

The partition corresponding to (154) is in (155), where p and q are propositions that represent possible conditions under which John will take an umbrella.

(155) $\{c_1 = \mathbf{take-umbrella}(j) \text{ if and only if } p, c_2 = \mathbf{take-umbrella}(j) \text{ if and only if } q, \dots\}$

Adopting the analysis of conditionals sketched in this chapter, the alternatives of (153) are the ones in (156) and given the question under discussions in (155), it is easy to see that the alternative that it's possible that John is not opinionated, $\Diamond\neg\mathbf{some}$, does not correspond to any cell or union of cells of (156) and it is then irrelevant. This in turn means that the inference to (157), which corresponds to its negation, is not expected.

$$(156) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \Box[\mathbf{think}_j(p) \rightarrow \mathbf{take-umbrella}(j)] \\ \Box[(\mathbf{think}_j(p) \vee \mathbf{think}(\neg p)) \rightarrow \mathbf{take-umbrella}(j)] \\ \Diamond\neg\mathbf{think}_j(p) \\ \Diamond\neg(\mathbf{think}_j(p) \vee \mathbf{think}(\neg p)) \\ \Diamond\neg\mathbf{take-umbrella}(j) \\ \Diamond\mathbf{take-umbrella}(j) \end{array} \right\}$$

(157) John is opinionated as to whether it is raining.

As we saw above, in the case soft presuppositions, given that I am assuming that alternatives are not subject to relevance, the corresponding inference from (158a) to (158b) is predicted to arise, regardless of the question under discussion.

- (158) a. Mary is celebrating, if she won.
b. Mary participated.

As I discussed, the only way to suspend (158b) is via local exhaustification as in (159). Given that (159) violates the **do not weaken!** requirement, it can only happen if there is explicit information in the context in contradiction with what global exhaustification would yield.

(159) If [EXH[Mary won_[+α]]] she is celebrating.

In sum, if we assume both the account of neg-raising inferences as scalar implicatures outlined in CHAPTER 2 and the one of soft presuppositions as scalar implicatures defended in this chapter, we can account for the difference between the two, given the assumption about the difference in terms of obligatoriness of alternatives activation.

Chapter 4

Extensions: intervention and interactions

4.1 Introduction

In this chapter, I discuss how the scalar implicature-based account of soft presuppositions outlined in CHAPTER 3 can provide an account of their intervention effects in the licensing of NPIs and some puzzling cases regarding the interactions between soft presuppositions and regular scalar implicatures. As I discuss below, in both cases the grammatical theory of scalar implicatures adopted, based on exhaustivity operators projected in the syntax, will turn out to be crucial. The chapter is organized as follows: in section 4.2.1, I introduce intervention effects by scalar implicatures, in section 4.2.2, the gist of the proposal in informal terms, in section 4.3.3, I briefly summarize a previous account of the intervention of soft presuppositions and in section 4.3.4, I outline the proposal in detail. In section 4.3.4, I discuss the account of some puzzling cases regarding the interactions between soft presuppositions and other scalar implicatures and in section 4.5, I conclude the chapter. Furthermore, in Appendix A, I briefly compare the theory of soft presuppositions proposed in this and CHAPTER 3 to the scalar approach to presuppositions defended in Chemla in preparation and in Appendix B, I compare it to the theory of the soft-hard distinction proposed by Fox (2012b).

4.2 Soft presuppositions and intervention effects

One of the central discoveries of modern linguistics is the fact that although sentences are potentially unbounded, syntactic processes apply within domains that are limited by locality constraints. One important such constraint is represented by the so-called (Relativized) Minimality effects (Rizzi 1990, 2001, 2004). The idea behind minimality is simply that an operator should relate to its closest target. An abstract description of the configuration which gives rise to minimality effects is in (1).

- (1) In a configuration $X...Z...Y$
X cannot be related to Y if Z intervenes and Z has certain characteristics in common with X.

These effects show up across a variety of domains; one prominent example is in the area of so-called “chains”. A chain depicts the relation between an element in the position in which it appears and the position where it is interpreted.¹ The effect is that in general, a chain cannot be built between X and Y if something intervenes between them like in the configuration in (1). To illustrate, consider a chain between a question element and an adverbial position like (2).²

- (2) How did you solve the problem <how>?

If there is another *wh*-element, like *who*, intervening between *how* and its trace, the result is degraded.

- (3) *How do you wonder **who** could solve this problem <how>?

¹How chains have to be analyzed is not important here: they can be established by movement or some other alternative implementation.

²The angle brackets indicates that the element is interpreted but does not appear in that position; see Rizzi 2001 and references therein.

A central characteristic of the present proposal is the assumption that exhaustivity operators are projected in the syntax. These operators enter in agreement relations with scalar elements (e.g. *every* or *win*). This makes the prediction that the relation between EXH and its targets should be subject to minimality. A prediction which appears to be borne out in the case of scalar implicatures, as shown by Chierchia (2004, to appear). As I show below, this extends also to soft presuppositions. I will return to the details of this implementation later, but first I informally provide the gist of the idea by Chierchia (to appear) in the next subsection.

4.2.0.1 The intervention effects by scalar implicatures: a first pass

The main puzzle facing any account of NPIs is the fact that they appear to be grammatical only in the scope of downward entailing (DE) functions, like negation (Ladusaw 1979).³ For instance, (7a) is grammatical but (7b) is not.

- (7) a. Mary didn't make **any** mistake.
b. *Mary made **any** mistake.

Following Krifka (1994), Chierchia (2004, 2006, to appear) proposes a theory of NPIs as alternatives bearers which have to be obligatorily exhaustified. In his approach, NPI indefinites (e.g. *any*) are existential quantifiers associated with alternatives and exhaustified, they result in a contradiction unless they happen to be in the scope of a downward entailing (DE) function.⁴

³A DE function is defined as in (4) (from Gajewski 2007, where \Rightarrow indicates cross-categorical entailment).

- (4) A function f is downward entailing iff for any a, b in the domain of f such that $a \Rightarrow b$, then $f(b) \Rightarrow f(a)$.

To see that negation is a DE function, notice that while (5a) entails (5b), (6b) entails (6a).

- (5) a. It rained hard.
b. It rained.

(6) a. It didn't rain hard.
b. It didn't rain.

⁴More precisely, the DE function has to be in the scope of EXH and the NPI has to be in the scope of the DE function. See Chierchia to appear for discussion about details and complications, to which I cannot do justice here.

The hypothesis is that such contradictory meanings are the source of the ungrammaticality of cases like (7b).⁵ From this, it follows that whenever we have a configuration like (8), with a DE element like negation and an NPI in its scope, exhaustification has to take scope above negation as in (8), or the result will be contradictory.

(8) EXH[not [... NPI]]

If an element that can also enter into an agreement relation with EXH intervenes between EXH and the NPI we expect a minimality effect. In other words, the exhaustivity operator cannot enter into a relation with the NPI in a configuration like (9) by skipping the closer target, that is the scalar term.

(9) EXH[not ... [*scalar term* [... NPI]]]

The only configuration allowed is the one in which a relation is first established with the closest scalar term and then with the NPI. Notice, however, that, if the scalar term is a strong one, a scalar implicature is expected to arise, when it is embedded under negation. In other words, from a sentence like (10a) we expect the scalar implicature in (10b).

- (10) a. Theo didn't both play the guitar **and** drink coffee
b. Theo played the guitar or drank coffee

Once this implicature is considered, the environment in which the NPI lies is not downward entailing anymore. This, in turn, has the effect that when we exhaustify the NPI with respect to its alternatives, we get a contradiction. In this approach, therefore, the ungrammaticality of (11) is the result of a semantic crash due to the implicature.

(11) *Theo didn't both play the guitar **and** drink **any** coffee

⁵For this notion of contradictions that leads to ungrammaticality see Gajewski 2002 and Chierchia to appear.

The crucial role of the implicature is shown by the fact that a sentence parallel to (11) but with a weak scalar item like in (12), which does not give rise to any implicature, is instead completely grammatical.

(12) Theo didn't both play the guitar **or** drink **any** coffee

In sum, in a configuration like (13), exemplified by (11), we have no option: we cannot exhaustify below negation or we get a contradiction. Furthermore, given minimality, we have to exhaustify the scalar term before the NPI. This, however, gives rise to the scalar implicature in (10b) above, which disrupts the downward monotonicity of the context and, therefore, causes a contradiction when the NPI is exhaustified.

(13) EXH[not ... [*strong scalar term* [... NPI]]]

4.2.0.2 The intervention effects by soft presuppositions: a first pass

The present analysis treats soft triggers on par with strong scalar terms, so we expect that they should give rise to intervention effects in the same way. As I will show below in detail, this prediction is indeed borne out. Consider the case of *because* clauses: *because* leads to the inferences that its propositional arguments are true and these inferences appears to project as presuppositions, as shown by (14a)-(14c) which all give rise to the inferences in (14d) and (14e).⁶

- (14) a. John is going to NY because Mary is there.
 b. Is John going to NY because Mary is there?
 c. It's not true that John is going to NY because Mary is there.
 d. Mary is in NY.

⁶Some of the speakers I have consulted did not share the judgement that (14)[a] gives rise to the inferences in (14)[b]-(14)[e]. This could be accounted for by analyzing *because* not a soft trigger but as a regular scalar term like *every*. In this case, the theory of intervention by Chierchia (to appear) would apply to it without modifications or extensions. I leave the exploration of this hypothesis for further research.

- e. John is going to NY.

Furthermore these inferences appear to be soft presuppositions, as the ignorance diagnostic applied in (15a) and (15b) shows.

- (15) a. I don't know where Mary is now, but if John is going to NY because she is there, they have an affair.
- b. I don't know whether John is going to NY, but if he is going, because Mary is there, they have an affair.

Therefore, *because* appears to be a soft trigger and we expect that it should intervene in the licensing of NPIs, in the same way we saw that *everyone* intervenes. Indeed, it has been known since Linebarger 1987 that *because* clauses do intervene. Consider the contrast between (16a) and (16b).

- (16) a. *Dogs don't hear **because** they have **any** eyes. They hear because they have ears.
- b. Dogs don't hear **because** they have eyes. They hear because they have ears.

This is precisely what we expect in the present account: the configuration we have in (16a) is (17). Given minimality and the fact that *because* is an alternative bearer, it needs to enter into a checking relation with EXH before the NPI. It's only upon computing the exhaustification of the *because* clause that the NPI's alternatives can be exhaustified, but by this point the environment is no longer DE given the soft presupposition that arises from the EXH of *because*.

- (17) EXH[not[**because** [... NPI]]]

In the following, I discuss the intervention of presuppositions and the previous proposal by Homer (2010) and then I come back in detail to how the proposal here can account for the intervention by soft presuppositions.

4.2.1 The Intervention effects of presuppositions and previous accounts

Homer (2010), building on Linebarger 1987 and Chierchia 2004, observes that beyond scalar implicatures also presuppositions give rise to intervention effects. He discusses precisely the case of *because*-clauses and also cognitive factives in French, which behave in the same way.⁷

(19) (Context: Peter broke your Chinese vase.)

You are mad at Peter, not because he broke **anything**, but because he won't own up to it. Homer 2010:ex.43

(20) *Pierre n' a pas découvert que Marie a écrit **quoi que ce soit** à sa mère.
Pierre NEG has NEG found-out that Marie has written anything to her mother
Homer 2010:ex.26

'Pierre hasn't found out that Marie has written anything to her mother.'

In both cases, he argues, that the intervention effects should be traced back to the presupposition. Building on Chierchia's (2004) account, he proposes to extend the idea that scalar implicatures disrupt the licensing of NPIs to presuppositions. In other words, the proposal is that in order to check whether an NPI is in a downward entailing environment, we should not only look at the assertion (and its scalar implicatures) but we should also factor in its presuppositions. This means that if a sentence ϕ containing an NPI presupposes p , we should not ask whether ϕ creates a downward entailing contexts for the NPI but whether the conjunction $p \wedge \phi$ does. To illustrate, consider the example above in (19): we saw above that *because* leads to the inference that its propositional arguments are true. Assuming that these inferences are presuppositions, it is easy to see how they are predicted to disrupt the licensing of the NPI in Homer's (2010)

⁷Importantly, he also discusses the case of the strong trigger *too*, exemplified by (18a), which is degraded (for some speakers) as compared to the minimal variant in (18b).

(18) (Context: Mary said something interesting during the meeting.)

- a. *I doubt that John said **anything** interesting too. Homer 2010:ex.21
- b. I doubt that John said **something** interesting too.

too is not a soft trigger given the diagnostics above, it is therefore outside the coverage of the present proposal.

system. In a case like (19), repeated schematically in (21a), the relevant meaning for NPI licensing is not simply (21a) but it is (21b).

(21) for any propositional argument $\phi_{[NPI]}, \psi$:

- a. $\neg(\psi, \text{because } \phi_{[NPI]})$
- b. $\psi \wedge \phi_{NPI} \wedge \neg(\psi, \text{because } \phi_{NPI})$

One occurrence of the NPI is in a positive (non-DE) environment (the second conjunct in red), thus the licensing is predicted to be disrupted.

In sum, Homer's (2010) proposal predicts that the presuppositions of *because* and French cognitive factives intervene in the licensing of NPIs. Notice, however, that while this is an important step towards the understanding of the intervention effects of presuppositions and while it presents some analogies with the case of scalar implicatures, it is not clear how far the analogy goes. More specifically, in the first case, given an account of scalar implicatures as entailments of exhaustified sentences based on the presence of operators in the syntax and an independently motivated minimality constraint we immediately predict intervention effects. In other words, we have a syntactic and a semantic aspect going hand in hand: an agreement relation between an operator and its targets obeying minimality and the result of exhaustification giving rise to contradictions if the semantic environment does not have a certain property (DE-ness). It is the combination of these two factors that gives rise to an explanatory account in the case of scalar implicatures. In the case of presuppositions, instead, we have to assume that a different component of meaning, the presuppositional level, should play a role in the notion of monotonicity required for the licensing of NPIs. This, in turn, conflicts with claims in the literature which requires exactly the opposite: the presuppositional level should be ignored for NPI-licensing purposes (see von Stechow 1999, Homer 2012b for discussion) The present proposal, on the other hand, directly extends the syntax-semantics account of the intervention effects by scalar implicatures to the ones of soft presuppositions, thereby explaining the latter without further assumptions.

4.2.2 The proposal

In this section, I discuss the case of *because* in detail and then I point to how this account could be extended to other soft triggers. Before turning to the case of soft triggers, however, let's first discuss in more detail Chierchia's theory and how it can account for intervention effects by scalar implicatures.

4.2.2.1 Back to the case of scalar implicatures

As we saw above, NPIs are grammatical in cases like (7a) but not in a simple positive sentence like (7b). Chierchia's (to appear) exhaustivity-based theory of NPI licensing sketched above is based on three components: first, an NPI like *any* has the same basic lexical entry as that of a plain indefinite: an existential quantifier over some pragmatically determined domain of individuals, indicated as D , like in (22).

$$(22) \quad \llbracket \text{any} \rrbracket = \lambda P \lambda Q [\exists x \in D [P(x) \wedge Q(x)]]$$

Second, *any* is associated with a particular set of alternatives, so called domain alternatives. Domain alternatives are obtained by replacing the variable D with variables D' of the same type ranging over smaller non-empty domains, as illustrated in (23).⁸

$$(23) \quad \text{Alt}_D(\llbracket \text{any} \rrbracket) = \{\lambda P \lambda Q [\exists x \in D' [P(x) \wedge Q(x)]] : D' \subseteq D\}$$

Third, domain alternatives are assumed to be obligatorily active, in the same way as we assume for the alternatives of soft presuppositions. This means that *any* bears a domain alternative feature $[D]$, in addition to the feature $[\sigma]$ and the combination of σ and D can only be assigned value “+”. As a result, NPIs must enter into an agree relation with a higher operator carrying the same feature, i.e. EXH and hence they must be exhaustified.

$$(24) \quad \text{EXH} \neg [\text{Mary make any}_{[+\sigma], [D]} \text{ mistake}]$$

⁸I indicate domain alternatives as Alt_D to distinguish them from scalar ones.

This set of ingredients derives the distribution and interpretation of NPIs, in that it correctly predicts a contradictory meaning, unless the NPI lies in a DE environment.⁹ Furthermore, this account of NPIs licensing can be extended to provide a treatment of intervention effects by scalar implicatures, and as I propose below, by soft presuppositions as well.

The Intervention effects of scalar implicatures Chierchia (to appear) offers an analysis of intervention effects caused by conjunction and quantifiers, both scalar terms endowed with alternatives. An example of an intervention effect case is (28b), versus its minimal variant (28a).

- (28) a. Theo didn't play the guitar **or** drink **any** coffee
b. ??Theo didn't play the guitar **and** drink **any** coffee

Accounting for contrasts such as the one in (28) is done by appealing to both a semantic and syntactic requirement. Semantically, the intervention effect arises as a result of the scalar implicature which comes about as a result of having the conjunction in the scope of negation. Syntactically, the relation between the exhaustifying operator EXH and NPIs or scalar terms is subject to minimality, in the sense above. Let's look at each of these requirements in detail below.

⁹To illustrate, consider how this account can explain why (7a) is grammatical, while (7b) is not: if we exhaustify (7b) in (25a) with respect to its domain alternatives in (25b), we get (26).

- (25) a. $\exists x \in D[\text{mistake}(x) \wedge \text{make}(m, x)]$
b. $\{\exists x \in D'[\text{mistake}(x) \wedge \text{make}(m, x)] : \emptyset \neq D' \subseteq D\}$

- (26) $\llbracket \text{EXH} \rrbracket(25a) = \exists x \in D[\text{mistake}(x) \wedge \text{make}(m, x)] \wedge \neg \exists y \in D'[\text{mistake}(y) \wedge \text{make}(m, y)]$ for all non empty D' such that $D' \subseteq D$

(26) says is that there is at least one mistake in some domain D that Mary made, but that for all non-empty subsets D' of D , there is no mistake that Mary made. This is clearly impossible, hence we end up with a meaning that can never be true. In the case of (7a), instead, represented in (27a) with its alternatives in (27b), the domain alternatives are all entailed by (27a). If there is no mistake in some domain D that Mary made, there won't be any mistake in all subdomains D' of D . Hence, given the definition of EXH, it will turn out to be vacuous in this case.

- (27) a. $\neg \exists x \in D[\text{mistake}(x) \wedge \text{make}(m, x)]$
b. $\{\neg \exists x \in D'[\text{mistake}(x) \wedge \text{make}(m, x)] : D' \subseteq D\}$

The semantic side of the intervention effects can be illustrated in three steps. First step: consider two variants of (28a) and (28b) without NPIs, like (29a) and (29b), and notice that a difference between the two is that (29a) gives rise to the inference in (29c), while (29b) does not.

- (29) a. Theo didn't play the guitar and dance.
 b. Theo didn't play the guitar or dance.
 c. Theo played the guitar or danced

Second step: as we saw in the last section, a sentence like (30) is predicted to be felicitous in Chierchia's (to appear) account, because exhaustification of an NPI in the scope of a DE function is just vacuous (it does not result in a contradictory meaning).

- (30) Theo didn't drink any coffee

Third step: putting these two pieces together and going back to the contrast in (28a) versus (28b), we can now see that the scalar implicature makes it so that the NPI *any* does not lie in a DE environment anymore and thus it cannot be licensed. Consider (28a) first. Following Chierchia (to appear), I assume the LF in (31), where the NPI and the scalar term each have their own exhaustivity operator, as indicated by the co-indexing.¹⁰

- (31) $\text{EXH}_i \text{EXH}_j [\neg [\text{Theo play the guitar } \mathbf{and}^j_{[+\sigma]} [\text{drink } \mathbf{any}^i_{[+\sigma, +D]} \text{ coffee }]]]$

In the interpretation of (31) we first exhaustify (32a) with respect to its alternatives in (32b) and we obtain (33).

- (32) a. $\neg [\mathbf{play-guitar}(t) \wedge \exists x \in D[\mathbf{coffee}(x) \wedge \mathbf{drink}(t, x)]]$
 b. $\text{Alt}(32a) = \left\{ \begin{array}{l} \neg [\mathbf{play-guitar}(t) \vee \exists x \in D[\mathbf{coffee}(x) \wedge \mathbf{drink}(t, x)]] \\ \neg [\mathbf{play-guitar}(t) \wedge \exists x \in D[\mathbf{coffee}(x) \wedge \mathbf{drink}(t, x)]] \end{array} \right\}$

¹⁰See Chierchia (to appear:ch. 7) for arguments in favor of separate exhaustification of the scalar and domain alternatives.

$$(33) \quad \neg[\text{play-guitar}(t) \wedge \exists x \in D[\text{coffee}(x) \wedge \text{drink}(t, x)]] \\ \wedge [\text{play-guitar}(t) \vee \exists x \in D[\text{coffee}(x) \wedge \text{drink}(t, x)]]$$

One can see that once the scalar implicature is added the second conjunct (in blue) in (33) is positive making the conjunction as a whole no longer DE. This means that when we exhaustify with respect to the domain alternatives of *any* in (34b), all alternatives are logically independent. Since they are all logically independent, the exhaustification negates them all and a contradiction ensues (I show this in Appendix C).

$$(34) \quad \text{a. } \neg[\text{play-guitar}(t) \wedge \exists x \in D[\text{coffee}(x) \wedge \text{drink}(t, x)]] \\ \wedge [\text{play-guitar}(t) \vee \exists x \in D[\text{coffee}(x) \wedge \text{drink}(t, x)]] \\ \text{b. } \text{Alt}_D(34a) = \{ \neg[\text{play-guitar}(t) \wedge \exists x \in D'[\text{coffee}(x) \wedge \text{drink}(t, x)]] \wedge [\text{play-guitar}(t) \vee \\ \exists x \in D[\text{coffee}(x) \wedge \text{drink}(t, x)]] : D' \subseteq D \}$$

On the other hand, in (28a), since *or* is in the scope of negation, it does not give rise to any scalar implicatures and thus the exhaustification of the NPI proceeds as if it were directly under negation.

$$(35) \quad \text{EXH}_i \text{EXH}_j [\neg [\text{Theo play the guitar } \text{or}_{[+\sigma]}^j [\text{drink } \text{any}_{[+\sigma, +D]}^i \text{ coffee }]]]$$

In sum, the approach can account for the contrast in (28a) versus (28b); there are, however, two open issues at this point: the first regards the order between exhaustification of the scalar term and exhaustification of the NPI; to obtain the intervention effect above, the order of exhaustification between scalar and domain alternatives is crucial. To illustrate, consider the LF in (36), where we first exhaustify the NPI and then the scalar term *and*.

$$(36) \quad \text{EXH}_j \text{EXH}_i [\neg [\text{Theo play the guitar and}_{[+\sigma]}^j [\text{drink } \text{any}_{[+\sigma, +D]}^i \text{ coffee }]]]$$

Notice that at the point of the first exhaustification the NPI lies in a downward entailing environment, thus exhaustification is just vacuous; then we exhaustify again and add the scalar

implicature and the result is obviously non-contradictory: Theo didn't both played the guitar and drink coffee, but he did one or the other. The first question is, then, what rules out the LF in (36).

The second issue regards the fact that, as we saw above, scalar terms can have the alternatives inactive, so why can't we have the LF in (37), where *and* has no active alternatives? In this case the scalar term *and* would not be exhaustified and would thus not create intervention.

(37) $\text{EXH}_i[-[\text{Theo play the guitar and}_{[-\sigma]} [\text{drink any}_{[+\sigma, +D]}^i \text{ coffee }]]]$

These two issues are resolved on syntactic grounds. Recall that we are assuming that NPIs bear the feature $[\sigma]$ and the feature $[D]$ and that the combination $[\sigma, D]$ can only get the value “+” (the alternatives of NPIs are obligatorily active). This means that an exhaustivity operator C-commanding them has to be present or the derivation will crash. A precise formulation of minimality is (38).¹¹

(39) **Minimality:** EXH must target the closest potential alternative bearer

- a. A bearer XP of $[\sigma]/[D]$ is closest to EXH iff:
 - (i) EXH asymmetrically C-commands XP
 - (ii) There is no other bearer YP of the relevant features (σ, D) such that EXH asymmetrically C-commands YP and YP C-commands XP

We can now see that this notion of minimality rules out the first problematic case in (36), repeated in (40), in which the order of exhaustification makes it so that the result is not contradictory.

(40) $\text{EXH}_j \text{EXH}_i[-[\text{Theo play the guitar and}_{[+\sigma]}^j [\text{drink any}_{[+\sigma, +D]}^i \text{ coffee }]]]$

¹¹The notion of C-command assumed here is (39).

(38) **C-command:** A C-commands B iff A doesn't dominate B and the first relevant branching node that dominates A dominates B

Notice that in (40) the first exhaustivity operator is not targeting the closest potential alternative bearer, in the sense in (39) above, thus the configuration turns out to be syntactically ill-formed.¹² Finally, the second problematic case in (42) is also ruled out in the way above: the exhaustivity operator has to target the closest *potential* bearer, thus it cannot skip it and target *any*.

(42) EXH_i[¬[Theo play the guitar and_[−σ] [drink any_[+σ,+D]ⁱ coffee]]]

Summing up, the scalar implicature based approach, together with a syntactic constraint of minimality, can account for the intervention effects in a case like (28b), repeated below in (43).

(43) ??Theo didn't play the guitar and drink any coffee

(43a) can be analyzed as (44a), (44b) or (44c). However, (44a) and (42) are ruled out on syntactic grounds via **minimality** above, while (44c) is syntactically well-formed, but it gives rise to a contradictory meaning.

- (44) a. EXH_jEXH_i[¬[Theo play and_[+σ]^j [drink any_[+σ,+D]ⁱ coffee]]]
b. EXH_i[¬[Theo play and_[−σ] [drink any_[+σ,+D]ⁱ coffee]]]
c. EXH_iEXH_j[¬[Theo play and_[+σ]^j [drink any_[+σ,+D]ⁱ coffee]]]

In the following, I show how we can extend this approach straightforwardly to the case of soft presuppositions.

¹²Notice that minimality allows the configuration with the opposite order in (41), repeated from above. However, as we saw, (41) gives rise to a contradiction, thus it is ruled out by the semantic side of the account.

(41) EXH_iEXH_j[¬[Theo play the guitar and_[+σ]^j [drink any_[+σ,+D]ⁱ coffee]]]

4.2.3 Intervention effects by soft presuppositions

4.2.3.1 The case of *because*-clauses

I argued above that *because* leads to the soft presuppositions that its propositional arguments are true. I analyze *because*-clauses as strong scalar items, like all other soft triggers; for concreteness, I adopt Schlenker's (2008b) simplified semantics of *because*, where *p because q* roughly means *p* and *q* and if not *q* then not *p*.¹³ Furthermore, I assume that the two entailments *p* and *q* are also alternatives.¹⁴

- (45) a. $\llbracket \text{because} \rrbracket(p)(q) = [(p \wedge q) \wedge \Box(\neg q \rightarrow \neg p)]$
 b. $\text{Alt}(45a) = \left\{ (p \wedge q) \wedge \Box(\neg q \rightarrow \neg p), p, q \right\}$

Given the meaning in (45a) and the alternatives in (45b), it is easy to see that the inferences to the truth of the arguments of *because* behave as the other soft presuppositions illustrated above. So for instance, the inference that Mary is in NY arises as a plain entailment in the case of (46a) and as a scalar implicature in the case of (46b).

- (46) a. John is going to NY because Mary is there.
 b. It's not true that John is going to NY because Mary is there.

On the other hand, the negation case in (46b), represented in (47a), has the alternative in (47b), thus its exhaustification is going to give rise to the result in (47c).

- (47) a. $\llbracket \text{EXH} \rrbracket(\neg \llbracket \text{because}(p)(q) \rrbracket)$
 b. $\text{Alt} = \left\{ \neg[(p \wedge q) \wedge \Box(\neg q \rightarrow \neg p)], \neg p, \neg q \right\}$
 c. $\neg[(p \wedge q) \wedge \Box(\neg q \rightarrow \neg p)] \wedge p \wedge q$

¹³See also Lewis 1973a and Dowty 1979. Schlenker (2008b) analyzes the conditional as a version of Stalnaker's (1975) semantics of conditionals. For consistence with the above, I adopt a strict conditional semantics of conditionals, but nothing hinges on this point.

¹⁴Notice that under Abrusán's (2011a) algorithm we only predict that the *because* clause, *p*, should be an alternative. The matrix sentence, *q*, is not independent from the matrix sentence. Nothing changes with respect to the intervention effects from the *because*-clause discussed below.

Because-clauses as interveners We saw above that *because* clauses are also interveners. More precisely, as Homer (2010) discusses, the generalization appears to be that NPIs cannot be licensed within *because*-clauses when the presuppositions of the latter go through but are instead felicitous in contexts in which they appear to be suspended (Homer 2010, Chierchia to appear see also Linebarger 1987). To illustrate, consider the contrast between (48) repeated from above and (49) also from Homer 2010.

(48) (Context: Peter broke your Chinese vase.)

You are mad at Peter, not because he broke anything, but because he won't own up to it.

(49) You are mad at Peter, not because he broke anything (of course, he never did such a thing), but because he says you are on the chubby side.

As we are analyzing *because* as a strong scalar item, we can straightforwardly extend Chierchia's (to appear) account to analyze its intervention effect. Let me illustrate this: first, the semantic side of the account predicts that a sentence like (50) with the LF in (51) winds up being contradictory.

(50) *You are mad at Peter not because he broke anything.

(51) $\text{EXH}_i \text{EXH}_j [\neg [\text{You are mad at Peter } \mathbf{because}_j \text{ he broke } \mathbf{anything}_i]]$

When we first exhaustify *because* with respect to the alternatives in (52a), we get the result in (52b): the inferences that you are mad at Peter and that he broke something.

$$\begin{aligned}
 (52) \quad & \text{a. } \text{Alt} = \left\{ \neg [\mathbf{because}(\exists x \in D[q_x])(p)], \neg \exists x \in D[q_x], \neg p \right\} \\
 & \text{b. } \llbracket \text{EXH} \rrbracket (\neg [\mathbf{because}(\exists x \in D[q_x])(p)]) = \\
 & \quad \neg [(p \wedge \exists x \in D[q_x]) \wedge \Box (\neg \exists x \in D[q_x] \rightarrow \neg p)] \wedge p \wedge \exists x \in D[q_x]
 \end{aligned}$$

These inferences disrupt the DE character of the context in which *any* occurs. As a result, when we exhaustify with respect to the domain alternatives a contradiction arises (I show in Appendix C that (53) and the negation of all alternatives in (54) is a contradiction).

$$(53) \quad \neg[(p \wedge \exists x \in D[q_x]) \wedge \Box(\neg \exists x \in D[q_x] \rightarrow \neg p)] \wedge p \wedge \exists x \in D[q_x]$$

$$(54) \quad \{\neg[(p \wedge \exists x \in D'[q_x]) \wedge \Box(\neg \exists x \in D'[q_x] \rightarrow \neg p)] \wedge p \wedge \exists x \in D'[q_x] : D' \subseteq D\}$$

Furthermore, the present proposal can also account for the fact that when the inferences are suspended intervention effects do not arise. Recall that contrary to (48), (49) above is grammatical. I propose that (49) should be analyzed with the LF in (55), where we exhaustify the scalar term *because* below negation.

$$(55) \quad \text{EXH}_i[\neg[\text{EXH}_j[\text{You are mad at Peter } \mathbf{because}_j \text{ he broke } \mathbf{anything}_i]]]$$

As seen above, exhaustification of *because* below negation is vacuous, thus no inference is predicted and the DE-ness of the environment in which *any* appears is not disrupted. We then exhaustify the NPI and again the result is vacuous, so we predict the felicity of (49).¹⁵ Fi-

¹⁵Notice that the proposal predicts that whenever the presupposition is not triggered, the intervention effect should be suspended. As Chierchia (2004, to appear) notices, on the other hand, the intervention effects appear to remain even in the absence of scalar implicatures, as the following example shows.

$$(56) \quad \text{I think no student read anything, therefore...?I doubt that every student read anything. Homer 2010}$$

A question at this point is why can't we do the same as above for *because*, that is, why we can't have the LF in (57), which does not give rise to a contradictory meaning.

$$(57) \quad \text{EXH}_j[\neg\text{EXH}_i[\mathbf{every}_i \text{ student read } \mathbf{anything}_j]]$$

I argue that this can be traced back to the difference between scalar terms and soft triggers, which is the (non)-obligatoriness of the alternatives. We saw above that the theory of scalar implicature by Chierchia (to appear) has a redundancy in the way scalar implicatures coming from strong scalar items can be suspended: via deactivation of alternatives as in (58a) or via local exhaustification as in (58b).

$$(58) \quad \begin{array}{ll} \text{a.} & \text{Not every}_{[-\sigma]} \text{ student came} \\ \text{b.} & \text{Not EXH}[\mathbf{every}_{[+\sigma]} \text{ student came}] \end{array}$$

I assume the economy condition in (59), which requires that if you can obtain suspension via the deactivation of the alternatives, then you should not obtain it through local exhaustification.

nally, the syntactic side of Chierchia’s (to appear) account guarantees that (60), which is not contradictory, is excluded by minimality.¹⁶

- (60) EXH_jEXH_i[¬[You are mad at Peter **because**_j he broke **anything**_i]]

Summing up, the present proposal can account for the intervention effect of *because* by adopting Chierchia’s (to appear) scalar implicature-based account of intervention. In the next section, I discuss the case of the other soft triggers.

4.2.3.2 Other soft triggers

We saw that *because* leads to intervention effects and that the present account predicts this straightforwardly. The same analysis can be extended to French cognitive factives so that to predict the intervention of (61) and the non-intervention of (62).¹⁷

- (61) *Pierre n’ a pas découvert que Marie a écrit **quoi que ce soit** à sa mère.
 Pierre NEG has NEG found-out that Marie has written anything to her mother
 Homer 2010:ex.26

‘Pierre hasn’t found out that Marie has written anything to her mother.’

- (62) Si Pierre découvrirait que Marie ait écrit **quoi que ce soit** à sa mère, il
 if Pierre found-out that Marie have.SUBJ written anything to her mother he
 serait fâché.
 would-be mad
 ‘If Pierre found out that Mary had written anything to her mother, he would be mad.’

-
- (59) **Do not exhaustify locally if you have other options:**
 EXH[... + σ...] is disallowed if EXH[... + σ...] = [¬σ]

It is easy to see that (59) rules out the LF in (58b).

¹⁶It is not contradictory, for the same reason as above: the exhaustification of the NPI happens in a DE context, hence it is vacuous, and only after the inferences of *because* are added.

¹⁷In (121d) assume a context in which Marie hasn’t written to her mother, that is where the presupposition is suspended.

As Homer (2010) discusses, when we look at other triggers the picture is more complicated. For instance, when we look at aspectuals like *stop* there appears to be no intervention.

(63) John hasn't stopped smoking **anything** Homer (2010:ex.92)

As Chierchia (to appear) discusses, however, (63) shows that *stop* does not intervene only if we can be sure that *anything* scope below *stop*.¹⁸

The case of English factives like *know* in (65) appears to show more convincingly a case of non-intervention by a soft trigger. (65) is felicitous and the NPI is arguably taking scope below the factive, because an inverse scope interpretation would violate general constraints on scope taking operations (e.g., clause-boundedness).

(65) John has kissed his neighbor. Mary doesn't know that he kissed **anybody**. Homer (2010:ex.80)

Homer (2010) leaves open on how to account for the difference between triggers.¹⁹ How can we integrate this data into the present account? I am assuming that soft triggers are also endowed with [σ]. As we discussed, we expect that the relation between EXH, NPIs, and scalar items is subject to minimality. Notice that one characteristic of minimality effects is that they occur with elements that are “similar enough”. In other words, in a configuration $X...Z...Y$, Z intervenes in the potential relation between X and Z only if Z is in some sense similar enough to Y , otherwise it can be ignored. What notion of “similar enough” should we use? Rizzi (2001, 2004) discusses

¹⁸A similar explanation in terms of scope applies to the case of *win* in (64), as *win* doesn't take propositional or property objects, so there is just no scope-site for the NPI below *win* (thanks to Irene Heim (p.c.) and Nathan Klinedinst (p.c.) for discussion on this point)

(64) John didn't win any race

¹⁹In Homer 2012b, he sketches an idea in terms of derivation timing of sentences and their presuppositions, in which the introduction of presuppositions can occur before or after NPI licensing, depending on the trigger and on the language.

the issue at length and proposes an implementation in terms of classes of features.²⁰ We can assume that there is a feature $[\pi]$ which is analogous to $[\sigma]$ but does not belong to the same class of feature for the purpose of minimality. The hypothesis is that there is variation both within a language and across languages among soft triggers in terms of which feature they bear between $[\sigma]$ and $[\pi]$: English factives would have the feature $[\pi]$ while *because* and French factives the feature $[\sigma]$. Given that $[\pi]$ is not of the same class of σ , EXH can skip it and target the NPI in a configuration like (68).²¹

(70) EXH[... *soft trigger* $_{\pi}$... *NPI* $_{[\sigma, D]}$]

4.2.3.3 Summing up

I have shown how the present proposal provides an account of the intervention effects exhibited by *because* and French cognitive factives. Furthermore, I also sketched how the non-intervention of other soft triggers can be accommodated in the present feature-based account. As we saw, adopting the grammatical theory of scalar implicatures in that it allows us to appeal

²⁰One example of this aspect of minimality effects, is that different adverbs intervene differently, so for instance in French *beaucoup* (a lot) intervenes in (66) but *attentivement* (carefully) does not as shown in (67).

(66) *Combien a-t-il **beaucoup** consulté <combien> de livres?
How many did he a lot consulted of books?

(67) Combien a-t-il **attentivement** consulté <combien> de livres?
How many did he carefully consulted of books?

Rizzi (2001, 2004) proposes to distinguish between these cases by using a notion of classes of features and that those adverbs belong to different classes.

²¹Consider the case in (68), from above: we can analyze it with the LF in (68), where we first exhaustify the NPI and no contradictory meaning is predicted.

(68) EXH_j[EXH_i¬[Mary know_[+\pi]^j that he kissed anybody_[+\sigma, +D]ⁱ]]

Notice that either a new EXH targets the soft trigger, thus giving rise to the presupposition or if the soft presupposition is suspended, we first exhaustify the strong scalar item below negation suspending the presupposition. Then we exhaustify the NPI.

(69) [EXH_i¬EXH_j[Mary know_[+\pi]^j that he kissed anybody_[+\sigma, +D]ⁱ]]

to minimality relations between the operator, the NPI and other scalar items in order to account for the exclusion of certain configurations that otherwise present no problems from a purely semantic perspective. Insofar that this account of intervention can be shown to be successful, it constitutes an argument for the present syntactic-semantic approach against purely pragmatic alternatives like Chemla in preparation (see Appendix A).

4.3 The interactions with “regular” scalar implicatures

The interaction between presuppositions and scalar implicatures has been recently discussed by Chierchia (2004), Simons (2006), Russell (2006, 2012), Geurts (2010), Chemla (in preparation) and Gajewski and Sharvit (2012). Chierchia (2004) discusses the case in (71a) in which a scalar implicatures is apparently computed on the presupposition.²²

- (71) a. John knows that some of the students are waiting for him.
 b. $\neg \rightarrow$ Some but not all of the students are waiting for him.

One way to account for the inference above in the present system is by globally exhaustifying the sentence with respect to the combined alternatives of the factive predicate and the ones of the scalar item *some*. This is because, abbreviating (71a) as in (72a), the alternatives are the ones in (72b) and crucially *all of the students are waiting for John* (p_{\forall}) is among the excludable ones, hence we get the prediction that its negation is among the implicatures of the sentence. In other words, that it’s not the case that all students are waiting for John.²³

- (72) a. **know_j** ϕ_{SOME}

²²Chierchia (2004) uses it as an argument in favor of local application of scalar implicatures, which we can of course reproduce here as local application of EXH. In the following cases I focus on the global application of EXH.

²³We also get the less surprising inferences that it’s not true that John believes that all of the students are waiting for him.

- b. $\text{Alt} = \left\{ \begin{array}{l} \mathbf{know}_j \phi_{\text{SOME}} \\ \mathbf{know}_j \phi_{\text{ALL}} \\ \phi_{\text{ALL}} \\ \phi_{\text{SOME}} \end{array} \right\}$
- c. $\text{Excl} = \left\{ \mathbf{know}_j \phi_{\text{ALL}}, \phi_{\text{ALL}} \right\}$
- d. $\text{EXH}(\mathbf{know}_j \phi_{\text{SOME}}) = \mathbf{know}_j \phi_{\text{SOME}} \wedge \neg \mathbf{know}_j \phi_{\text{ALL}} \wedge \neg \phi_{\text{ALL}}$

We can, hence, account for some simple cases of the interaction between soft presuppositions and scalar implicatures. Recently, Simons (2006) has pointed out two more challenging cases for theories of scalar implicatures. I will show that in the present system these cases can simply be treated as cases of multiple scalar items.

4.3.1 Two puzzling cases

4.3.1.1 *Sorry*

The first case is one in which a scalar item is embedded in the scope of an emotive factive like *sorry*. The relevant reading can be informally described as one in which there is an implicature at the presuppositional level, as John believes that some but not all of the students failed the exam, but there is no scalar implicature at the assertion level, as there is no implication that he is sorry that not all of the students failed the exam.

- (73) a. John is sorry that some of the students failed the exam.
b. \rightsquigarrow John believes that some but not all of the students failed the exam.
c. \nrightarrow John is sorry that some but not all of the students failed the exam.

Let's first assume the following lexical entry for *sorry*, modeled on Gajewski and Sharvit (2012), where *x is sorry that p* simply means that x believes that p and that p is the case and that x does not want it. Also, along the lines of the other soft triggers above, I assume the alternatives in

(74b).²⁴

$$(74) \quad \begin{array}{ll} \text{a.} & \llbracket \text{sorry} \rrbracket(p)(x) = \lambda w [\mathbf{want}_{x,w} \neg p \wedge \mathbf{believe}_{x,w} p \wedge p_w] \\ \text{b.} & \text{Alt} = \left\{ \begin{array}{l} \lambda w [\mathbf{want}_{x,w} \neg p \wedge \mathbf{believe}_{x,w} p \wedge p_w] \\ \lambda w [\mathbf{believe}_{x,w} p] \\ \lambda w [p_w] \end{array} \right\} \end{array}$$

Going back to (73a), which we can schematize as in (75a), we get the alternatives in (75b) and the result of exhaustification leads precisely to the correct result that John believes that some of the students failed the exam and he doesn't believe that all of them did, but crucially not that he is sorry that not all of the students failed the exam. This is because once we exclude the alternative *all of the students failed the exam* (ϕ_{\forall}) and *John believes that all of the students failed the exam* ($\mathbf{believe}_j \phi_{\forall}$), the exclusion of the alternative that *John is sorry that all of the students failed the exam* ($\mathbf{believe}_j \phi_{\forall} \wedge \phi_{\forall} \wedge \mathbf{want}_j \neg \phi_{\forall}$) is already entailed, hence there are no further inferences predicted.²⁵

$$(75) \quad \begin{array}{ll} \text{a.} & \mathbf{believe}_j \phi_{\text{SOME}} \wedge \phi_{\text{SOME}} \wedge \mathbf{want}_j \neg \phi_{\text{SOME}} \\ \text{b.} & \text{Alt} = \left\{ \begin{array}{l} \phi_{\text{SOME}} \\ \phi_{\text{ALL}} \\ \mathbf{believe}_j \phi_{\text{SOME}} \\ \mathbf{believe}_j \phi_{\text{ALL}} \\ \mathbf{believe}_j \phi_{\text{SOME}} \wedge \phi_{\text{SOME}} \wedge \mathbf{want}_j \neg \phi_{\text{SOME}} \\ \mathbf{believe}_j \phi_{\text{ALL}} \wedge \phi_{\text{ALL}} \wedge \mathbf{want}_j \neg \phi_{\text{ALL}} \end{array} \right\} \end{array}$$

²⁴Again, as one can verify these are the ones predicted by applying Abrusán (2011b) algorithm.

²⁵Notice that the inference predicted is that it is not the case that John believes that all of the students failed the exam, with negation taking wide scope over the attitude predicate. In some cases we might want to obtain the stronger inference in which negation takes narrow scope, i.e. John believes that not all. There has been various proposal on how to strengthen the weak inference to the stronger one, see Russell (2006) and Simons (2006) among others. I will remain neutral at this point on how to do this. Thanks to Michael Franke (p.c.) for discussion on this point.

$$\begin{aligned}
\text{c. } \mathcal{E}_{\text{incl}} &= \left\{ \begin{array}{l} \phi_{\text{ALL}} \\ \mathbf{believe}_j \phi_{\text{ALL}} \\ \mathbf{believe}_j \phi_{\text{ALL}} \wedge \phi_{\text{ALL}} \wedge \mathbf{want}_j \neg \phi_{\text{ALL}} \end{array} \right\} \\
\text{d. } \text{EXH}(\mathbf{believe}_j \phi_{\text{SOME}} \wedge \phi_{\text{SOME}} \wedge \mathbf{want}_j \neg \phi_{\text{SOME}}) &= \\
& (\mathbf{believe}_j \phi_{\text{SOME}} \wedge \phi_{\text{SOME}} \wedge \mathbf{want}_j \neg \phi_{\text{SOME}}) \wedge \neg \phi_{\text{ALL}} \wedge \neg \mathbf{believe} \phi_{\text{ALL}}
\end{aligned}$$

4.3.1.2 Discover

The second case is a scalar item in the scope of a factive like *discover*. Again there is a straightforward and a more complicated case. Starting from the former, consider a case like (76a): the reading here is one in which John believes that some but not all of the students failed the exam and also that it is the case that some but not all of the students did it.

- (76) a. John discovered that some of the students failed the exam.
b. \rightsquigarrow John believes that some but not all of the students failed the exam.
c. \rightsquigarrow some but not all of the students failed the exam.

In this case, we can obtain these inferences by simply exhaustifying locally as in (77) within the complement of *discover*. This is because the two inferences in (76b) and (76c) above fall out as entailments of (77).

- (77) John discovered that $\text{EXH}[\text{some of the students failed the exam}] =$
John discovered that some but not all of the students failed the exam

Let's turn now to the more reading of (77a), which is one that does not entail (77b) but does still entail (77c). In this case, the relevant reading is one in which John believes that some and possibly all of the students failed the exam, but still it is inferred that it is the case that some but not all of the students failed the exam. The strategy for treating this case is similar to the one above: consider the entry in (78a) and the alternatives in (78b), where *x discovered that p* simply means that *x* did not believe that *p* at some time before the utterance time and that *x* now

believes it and that p is also the case.

$$(78) \quad \begin{array}{ll} \text{a.} & \llbracket \text{discover} \rrbracket(p)(x) = \lambda t [\neg \text{believe}_{x,t'} p \wedge \text{believe}_{x,t} p \wedge p_t] \\ & \text{for some time interval } t' \text{ such that } t' < t \\ \text{b.} & \text{Alt} = \left\{ \begin{array}{l} \lambda t [\neg \text{believe}_{x,t'} p \wedge \text{believe}_{x,t} p \wedge p_t] \\ \lambda t [\neg \text{believe}_{x,t'} p] \\ \lambda t [p_t] \end{array} \right\} \end{array}$$

Let's go back now to the case above in ?? represented schematically in (79a); once we apply the lexical entry in (78a) with respect to the alternatives in (78b), we obtain the correct result: in fact we only obtain the implicature that some but not all of the students failed the exam. Again, once we exclude the alternative *all of the students failed* (ϕ_{\forall}^t) the exclusion of the other excludable alternative is already entailed. So we only predict the inference that it's not the case that all of the students failed, thus predicting the reading above.

$$(79) \quad \begin{array}{ll} \text{a.} & \neg \text{believe}_{j,t'} \phi_{\text{SOME}} \wedge \text{believe}_{x,t} \phi_{\text{SOME}} \wedge \phi_{\text{SOME}}^t \\ \text{b.} & \left\{ \begin{array}{l} \phi_{\text{SOME}}^t \\ \phi_{\text{ALL}}^t \\ \neg \text{believe}_{j,t'} \phi_{\text{SOME}} \\ \neg \text{believe}_{j,t'} \phi_{\text{ALL}} \\ \neg \text{believe}_{j,t'} \phi_{\text{ALL}} \wedge \text{believe}_{x,t} \phi_{\text{ALL}} \wedge \phi_{\text{ALL}}^t \\ \neg \text{believe}_{j,t'} \phi_{\text{SOME}} \wedge \text{believe}_{x,t} \phi_{\text{SOME}} \wedge \phi_{\text{SOME}}^t \end{array} \right\} \\ \text{c.} & \mathcal{E}_{\text{xcl}} = \left\{ \begin{array}{l} \phi_{\text{ALL}}^t \\ \neg \text{believe}_{j,t'} \phi_{\text{ALL}} \wedge \text{believe}_{x,t} \phi_{\text{ALL}} \wedge \phi_{\text{ALL}}^t \end{array} \right\} \end{array}$$

$$(80) \quad \text{EXH}(\neg \text{believe}_{j,t'} \phi_{\text{SOME}} \wedge \text{believe}_{x,t} \phi_{\text{SOME}} \wedge \phi_{\text{SOME}}^t = \\ (\neg \text{believe}_{j,t'} \phi_{\text{SOME}} \wedge \text{believe}_{x,t} \phi_{\text{SOME}} \wedge \phi_{\text{SOME}}^t \wedge \neg \phi_{\text{ALL}}^t$$

Summing up, the present account can predict two puzzling cases of the interaction between presuppositions and scalar implicatures as simple cases of multiple scalar items.²⁶

4.4 Conclusion

In this chapter, I discussed how the account of soft presuppositions outlined in CHAPTER 2 can provide an account of the intervention effects by soft presuppositions in the licensing of NPIs. This, in particular, is allowed by the syntactic-semantic nature of the account, which postulates operators in the syntax and thus predicts that they should be subject to syntactic constraints such as minimality effects. Furthermore, I have shown that this approach can also solve some puzzling cases arising with scalar terms like *every* embedded in the scope of soft triggers. In Appendix A, I briefly compare the proposal here to the one by Chemla (in preparation) and in Appendix B, I compare it to the one by Fox (2012b).

4.5 Appendix A: comparison with Chemla in preparation

Chemla (in preparation) proposes a unified alternative-based approach to presuppositions, free choice inferences and scalar implicatures. The architecture is similar to Abusch (2010) proposal: a global pragmatic principle operates on a set of alternatives and gives rise to presuppositional inferences. In the following I briefly summarize his proposal and highlight the differences with respect to the theory proposed in this and the previous chapter.

4.5.1 A sketch of the theory

Chemla's (in preparation) has two main components: first, a method of constructing alternatives from a sentence (i.e. a set of replacements), which also provides a way of grouping them into

²⁶Gajewski and Sharvit (2012) can also account for it but they propose that scalar implicatures should also be computed at the presuppositional level. Here, instead, I avoid this complication of the system. Chemla (in preparation) can also account for cases of interactions between presuppositions and scalar implicatures in his system. However he does not discuss the cases above. I leave for further research the extent to which his system can be extended to account for the cases here.

separate subsets of alternatives. Second, a pragmatic principle that requires that a speaker is in the same epistemic status with respect to the alternative in each subset. Let us go through both components in more detail.

The method of constructing alternatives is based on the standard assumption that scalar items are associated to sets of lexical alternatives. In the case of scalar implicatures, Chemla (in preparation) assumes that a scalar item like *many* has the standard lexical alternatives *some* and *every*. A first novel aspect is that he also assumes that there are two additional scale mates, which are a strong contradictory alternative \perp and a weak tautological one \top .²⁷ Furthermore, Chemla (in preparation) assumes that there are three procedures for constructing alternatives, what he calls “transformations”: (a) “stronger replacements”, which substitute each scalar term with a stronger scale-mate, (b) “weaker replacements”, which do the same but with weaker scale-mates and (c) “connective split”, which for any sentence $p \otimes q$, where \otimes is any connective, it substitutes $p \otimes q$ with p and $p \otimes q$ with q . In the case of a sentence like (81a), schematized in (81b), we, hence, obtain the alternatives in (82) through stronger and weaker replacements.

(81) a. Many students came.

b. MANY

(82) $\left\{ \begin{array}{c} \top \\ \text{SOME} \\ \text{EVERY} \\ \perp \end{array} \right\}$

The second novel aspect of the proposal is that sets of alternatives like the one in (82) are then divided into subsets of alternatives, according to how they are constructed (stronger replacements, weaker replacements or connective split). The alternatives in each subset are called “similar” alternatives. In the case of (82) the subsets of similar alternatives are in (83a) and (83b).

²⁷More precisely he assumes that there are scale-mates that creates a tautological or contradictory meaning at the first scope site.

What (88) requires is that the speaker believes that some of the students came if and only if she believes the tautological proposition, in other words it requires that the speaker believes that some of the students came. This is already entailed by the assertion. (89), instead, requires that the speaker believes that every student came if and only if she believes the contradictory proposition. This, in turn, means that it's false that the speaker believes that every student came. We hence obtain the inference in (90) for a sentence like (81a).

$$(90) \quad \neg B_s[\text{every student came}]$$

The type of inferences in (90) are what Chemla (in preparation) calls “weak epistemic similarity inferences”. These inferences can then be strengthened given the assumption that the speaker is opinionated with respect to the alternatives: for any alternative ϕ , $(B_s[\phi] \vee B_s[\neg\phi])$ as long as the resulting inference is consistent with all the weak inferences.²⁹ So now when possible a weak similarity inference $(B_s[\phi] \leftrightarrow B_s[\psi])$ will be strengthened to a strong similarity inference $B_s[\phi \leftrightarrow \psi]$. In the case of (81a) we can strengthen (89) to (91).

$$(91) \quad B_s[\text{EVERY} \leftrightarrow \perp] = \\ B_s[\neg[\text{every student came}]]$$

Turning now to the case of presuppositions, Chemla (in preparation) assumes that any ϕ generally assumed to be a presuppositional trigger with presupposition p is instead a non-presuppositional scalar item associated to the alternatives p and $\neg p$. In addition, the weak tautological alternative \top and the strong contradictory one \perp are again assumed to be scale-mates. In the same way as above, the alternatives of a sentence like (92) are constructed and divided into two groups of similar alternatives, as in (93a) and (93b).

$$(92) \quad \begin{array}{ll} \text{a.} & \text{John knows that it's raining.} \\ \text{b.} & \text{KNOW}_j(\text{RAIN}) \end{array}$$

²⁹See Sauerland (2004) for an analogous strengthening process that he calls “the epistemic step”.

between these two systems with respect to scalar implicatures that I want to mention. The divergence regards the account of scalar implicatures that appear to be embedded (see Chierchia et al. To appear for discussion). The grammatical theory adopted here can simply merge the exhaustivity operator locally, and indeed one of the main argument for this approach is precisely the fact that it can easily account for embedded scalar implicatures. Chemla (in preparation), on the other hand, has to assume a local application of the pragmatic principle that he proposes (see Chemla (in preparation:pp.53-57) for discussion). While this is technically possible, one might find this conceptually undesirable, as discussed in Recanati 2003 among others.

Turning now to presuppositions, I want to emphasize four main differences between Chemla (in preparation)'s and the present proposal.

The first aspect regards how he responds to his own challenge discussed in CHAPTER 3, section 3.3.2. Recall that Chemla (2009a) claims that the scalar approach to presuppositions does not make the right predictions for presupposition projection from the scope of negative quantifiers. This is because it would predict the existential inference in (96b), while the participants of Chemla's (2009b) experiment reported the strong universal inference in (96c) for sentences like the one in (96a).

- (96)
- a. No student won.
 - b. Some student participated.
 - c. Every student participated.

More precisely, the inference in (96c) from (96a) was accepted more often than the analogous inference with a scalar implicature in (97c) from (97a).

- (97)
- a. No student did all of the readings.
 - b. Some student did all of the readings.
 - c. Every student did some of the readings.

I showed in CHAPTER 3 that by assuming independently motivated alternatives for negative

quantifiers we can in fact account for the universal inference in (97b) and furthermore, assuming a difference in terms of whether they are subject to relevance or not, we can also account for the difference between scalar implicatures and soft presuppositions. Chemla (in preparation), instead, responds to the challenge above by effectively abandoning the idea that presuppositional triggers are identical to strong scalar items, and assuming different alternatives for scalar implicatures and presuppositions. As I discussed in the last section, he assumes that presuppositional triggers have both a weaker alternative and its negation. In other words, a presupposition trigger ϕ has both the weaker p and its negation $\neg p$ as scale mates. On the other hand, strong scalar terms like *every* do not: *every* does not have \neg *some* in addition to *some* as a scale-mate. This difference is crucial in order to account for the difference between the projection from the scope of negative quantifiers, because he only predicts existential inferences in the case of scalar implicatures, while universal inferences for the case of presuppositions. To see this consider a sketch of the derivation for the case of (98a), with the set of similar alternatives in (98b) and (98c).

- (98) a. No one won.
 b. $\{\text{NO } x, \text{PARTICIPATED}(x), \text{NO } x, \top\}$
 c. $\{\text{NO } x, \neg \text{PARTICIPATED}(x), \text{NO } x, \perp\}$

The result of applying the epistemic similarity principle to the set in (98b) is the existential inference in (99): the speaker doesn't believe that no one participated, which can then be strengthened to the speaker believes that someone participated.

$$\begin{aligned}
 (99) \quad & B_s[\text{NO } x, \text{PARTICIPATED}(x) \leftrightarrow \text{NO } x, \top] = \\
 & B_s[\text{NO } x, \text{PARTICIPATED}(x) \leftrightarrow \perp] = \\
 & \neg B_s[\text{NO } x, \text{PARTICIPATED}(x)] = \\
 & B_s \neg[\text{NO } x, \text{PARTICIPATED}(x)] = \\
 & B_s[\exists x, \text{PARTICIPATED}(x)]
 \end{aligned}$$

The result of applying it to (99c) is, instead, is the universal inference in (100): the speaker believes that everyone participated.

$$\begin{aligned}
 (100) \quad & B_s[\text{NO } x, \neg \text{PARTICIPATED}(x) \leftrightarrow \text{NO } x, \perp] = \\
 & B_s[\text{NO } x, \neg \text{PARTICIPATED}(x) \leftrightarrow \top] = \\
 & B_s[\text{NO } x, \neg \text{PARTICIPATED}(x)] = \\
 & B_s[\forall x, \text{PARTICIPATED}(x)]
 \end{aligned}$$

Notice that the universal inference crucially comes from the set of similar alternatives that contains the negated alternative, which Chemla (in preparation) only assumes for presuppositions. In the case of *every* we do not have such alternative (i.e., we do not have $\neg \text{some}$), hence we can only obtain the existential inference. To see this consider (101a) with the only possible set of similar alternatives in (101b).

$$\begin{aligned}
 (101) \quad & \text{No student did all of the readings.} \\
 (101) \quad & \{ \text{NO } x, \text{SOME}, \text{NO } x, \top \}
 \end{aligned}$$

From (101b) we can only obtain the existential inference that the speaker doesn't believe that no student did some of the readings as shown in (102).

$$\begin{aligned}
 (102) \quad & B_s[\text{NO } x, \text{SOME} \leftrightarrow \text{NO } x, \top] = \\
 & B_s[\text{NO } x, \text{SOME} \leftrightarrow \perp] = \\
 & \neg B_s[\text{NO } x, \text{SOME}] = \\
 & B_s \neg [\text{NO } x, \text{SOME}] = \\
 & B_s[\exists x, \text{SOME}]
 \end{aligned}$$

In sum, by assuming different alternatives for presuppositions and strong scalar items Chemla (in preparation) can account for the difference between scalar implicatures and presuppositions in the acceptance of the universal projection inference in the case of the scope of negative quantifiers. I can see two problems in connection with this: first, contrary to the present proposal,

Chemla's (in preparation) system can never predict a universal inference for the case of scalar implicatures. I argued above, however, that a sentence like (103a) has (103b) as an inference.

- (103) a. None of these teachers killed all of their students.
 b. All of these teachers killed some of their students.

Furthermore, it is unclear why, given the motivations in chapter 3, section 3.5 we should not also have *not every* as a scale mate of *no*. Recall, in particular, that a sentence with *not every* in (104a) must have the alternative with *no* in (104b) in order to account for the inference from (104a) to (104c).

- (104) a. Not every student came.
 b. No student came.
 c. Some student came.

Furthermore, if we accept the arguments for the decomposition of *no* into negation plus indefinite (cf. CHAPTER 3, section 3.5), *not some*, it is unclear how to block the transformation of sentences containing *no* (=not some) so that it does not create sentential alternatives with *not every* (substituting *every* for *some* in the scope of negation). We could of course add to Chemla's (in preparation) system the assumption that *not every* is in fact a scale mate of *no* and we would obtain the universal inference in (103b). To see this consider the set of alternatives in (105b) that we would obtain by further replacing NO in the set in (105a) with NOT EVERY.

- (105) a. {NO x, SOME, NO x, \top }
 b. {NOT EVERY x, SOME, NOT EVERY x, \top }

Applying the epistemic similarity principle to (105b) we obtain (106): the speaker believes that everyone did some of the readings.

- (106) $B_s[\text{NOT EVERY } x, \text{SOME}] \leftrightarrow B_s[\text{NOT EVERY } x, \top] =$

$$B_s[\text{NOT EVERY } x, \text{SOME}] \leftrightarrow B_s[\perp] = \neg B_s[\text{NOT EVERY } x, \text{SOME}] = \\ B_s\neg[\text{NOT EVERY } x, \text{SOME}] = B_s[\text{EVERY } x, \text{SOME}]$$

We can, therefore, amend Chemla's (in preparation) system so as to obtain the inference in (103b), however the account that the offers for the difference between between presuppositions and scalar implicatures in the robustness of acceptance of the universal inference would be lost. The fact that the present proposal can account both for the possibility of the inference in (103b) and the difference between scalar implicatures and presuppositions is an argument in its favor.

A second difference regards the fact that the present proposal predicts an asymmetry between nuclear scope and restrictor of negative quantifiers in that soft presuppositions project universally from the former but not from the latter. In other words, the inference in (107c) is predicted from (107a) but not from (107b).

- (107) a. No student won.
 b. No student who won celebrated.
 c. Every student won.

This prediction appears intuitively correct. Furthermore, Chemla (2009b) also tested cases like (107b) in his experiments and while the results are less clear than in cases like (107a), they suggest that (107c) is accepted much less from (107b) than from (107a). This asymmetry is, however, not accounted for by Chemla (in preparation) and other recent accounts I am aware of.

The third aspect that distinguishes the present proposal from Chemla (in preparation) account is that the former is explicitly restricted to soft presuppositions and this can account for the context dependence of the former versus the latter and their difference in the case of quantificational sentences.³⁰

Finally, the fourth difference regards the fact that the present proposal is based on the gram-

³⁰Notice that one could restrict also Chemla (in preparation) account to soft presuppositions. If one doesn't, however, one has to provide a different way to account for the differences between soft and hard presuppositions with respect to context dependence and projection (see Chemla in preparation:p.41 for discussion).

mational theory of scalar implicature. As I have shown in this chapter, in particular the assumption of exhaustivity operators projected in the syntax predicts the intervention effects of soft presuppositions. In so far that this account of intervention can be shown to be successful, it constitutes an argument for the present syntactic-semantic approach against a purely pragmatic alternative like Chemla in preparation.

Summing up, I followed the idea in Chemla 2009a, but proposed to develop it differently from the alternative route explored in Chemla in preparation. As discussed above, the contributions of the present proposal are: first, the alternatives for negative quantifiers proposed here make better predictions both for the case of scalar implicatures and for that of soft presuppositions from scopes and restrictors of negative quantifiers. Second, restricting the theory to soft presuppositions, we can account for the differences between them and hard presuppositions. Third, assuming a difference between scalar implicatures and soft presuppositions in terms of the notion of obligatory implicatures, we can, in turn, account for their different behavior. Finally, the fact that the proposal here is based on an exhaustivity operator in the syntax allows an account of the intervention effects of soft presuppositions.

4.6 Appendix B: comparison with Fox 2012

4.6.1 A sketch of the theory

Fox (2008, 2012b) proposes a trivalent theory of presupposition projection, focusing in particular on how it can account for the complex pattern of projection of presuppositions embedded in the nuclear scope of quantificational sentences. In CHAPTER 5, I summarize the trivalent approach to presupposition projection in detail, here I want to focus just on one aspect of the proposal by Fox (2012b), namely the way he accounts for the differences between soft and hard presuppositions.³¹ Recall that there are two main differences a theory of presuppositions should account for: first, soft presuppositions appear to be easily suspendable in explicit ignorance con-

³¹Fox (2008, 2012b) also proposes a version of his account based on a bivalent, rather than trivalent, semantics, which reproduces and extends the predictions of the trivalent semantics account at the pragmatic level. For our purposes the differences between the two versions are not important, so I will disregard them here.

texts, while hard presuppositions do not (cf. CHAPTER 3). This is exemplified by (108a) and (108b).

- (108) a. I don't know whether John ended up participating in the race. But if he won, he will celebrate tonight.
- b. I don't know whether anybody read that book. #But if it was John, we should ask him what he thinks about it.

Second, as discussed in CHAPTER 3, soft and hard presuppositions appear to project differently in quantificational sentences: while the latter uniformly project universally, the projection of the former depends on the quantifier involved (Chemla 2009b and Charlow (2009)). In particular, when embedded under a quantifier like *no* or *some* the presupposition of strong triggers like *also* appears to always project universally: both (109a) and (109b) tend to give rise to the inference in (109c).

- (109) a. None of these ten boys also smokes Marlboro.
- b. Some of these ten boys also smokes Marlboro.
- c. Each of these ten boys smoke something other than Marlboro.

On the other hand, soft triggers like *stop* appear to project differently from the scope of *no* and the one of *some*: while (110a) tends to give rise to the inference in (110c), (110b) does not.³²

- (110) a. None of these ten boys stopped smoking.
- b. Some of these ten boys stopped smoking.
- c. Each of these ten boys used to smoke.

The proposal on how to account for such differences is based on two ideas. The first idea is that

³²Fox (2012b) also argues that there is another dimension of variation, which comes from individual differences among different speakers (see also Sudo et al. to appear). He furthermore proposes that we can account for the speaker's variability by assuming a preference with respect to whether a speaker is willing to locally accommodate or not. I will disregard this part of the proposal here and leave for further research how to account for speakers' variability in the account proposed here.

presuppositions are suspended by the use of a local accommodation operator, the (A)ssertion-operator (Beaver and Krahmer (2001)).³³ I refer the reader to CHAPTER 5 for the details on the semantics of the A-operator, for our purposes here, it is enough to know that applying A to a sentence ϕ with presupposition p is equivalent to asserting the conjunction of ϕ and p . The idea is that a sentence like (111a) does not have the presupposition that Paul participated because it has an A-operator in the antecedent, which makes it equivalent to (111b).

- (111) I don't know whether Paul participated or not.
- a. But If A[he won], he will celebrate tonight.
 - b. But if he participated and won, he will celebrate tonight.

Furthermore, Fox (2012b) shows that the A-operator can also account for the difference between quantifiers. His accounts, in fact, predicts uniform universal projection of presuppositions (given a principle of presupposition strengthening), however through the use of the A-operator one can also account for the differences between quantifiers, in particular for the non universal projection in cases like (110b) above.

The second idea is that the difference between soft and hard presuppositions has to do with the fact that the former can be locally accommodated and the latter cannot. In the system he proposes, this means assuming a constraint along the lines of (116).³⁴

³³Fox (2012b) calls it the “B” operator, as the original idea was proposed by the logician Dmitri Bochvar.

³⁴As Fox (2012b) acknowledges in fn.19, the condition that the A-operator cannot be applied to strong triggers cannot be as simple as (116). The problem is that we want to allow cases of suspension of soft presuppositions, even when a soft trigger is embedded into a strong one. For instance in (112a), where *stop* appears in the scope of *also*, we nonetheless need to insert the A operator in order to suspend the presupposition of *stop*.

- (112) *I know John stopped drinking. I don't know whether he used to smoke too.*
- a. But if he also stopped smoking, he must be very proud of himself.
 - b. But if A[he [also [stopped smoking]]], he must be very proud of himself.

Fox (2012b) suggests that we co-index the A-operator with the soft trigger, the presupposition of which we want to locally accommodate. The constraint in (116) could be then modified as (113).

- (113) The A-operator cannot be co-indexed with a strong trigger and applied to a constituent that contains it.

As I discuss in Romoli 2012, the indexing between the A-operator and its trigger is independently motivated, if we

(116) The A-operator cannot be applied to constituents that contain a strong trigger.

As he shows, given (116) the system can account for the differences in suspension and projection between strong and hard presuppositions. In brief, (117) would be infelicitous because we cannot insert the A-operator and (118a) would only have the universal inference in (118b) for the same reason.

(117) I don't know whether anybody read that book.

#But if it was John, we should ask him what he thinks about it.

(118) a. Some of these ten boys also smokes Marlboro.

b. Each of these ten boys smoke something other than Marlboro.

Let us now turn to a brief comparison between this system and the proposal outlined in CHAPTER 2 and 3.

4.6.2 Comparison

The main point in favor of the account proposed in CHAPTER 3 and CHAPTER 4 regards the fact that the use of alternatives for soft triggers provides an account of puzzling cases of interactions between soft presuppositions and regular scalar implicatures (CHAPTER 4 section 4.3). Furthermore, the use of the exhaustivity operator also allows an account of intervention effects by soft presuppositions in the licensing of negative polarity items (CHAPTER 4 SECTION

want to maintain an account of conflicting presuppositions in disjunctions via local accommodation, that is, if we want to analyze (114a) as (114b) (see Soames 1979, Heim 1983 and Beaver and Krahmer (2001) for discussion).

(114) a. John stopped smoking or he started smoking.

b. [A[John stopped smoking] or A[John started smoking]]

The argument for co-indexing the A-operator and its trigger comes from cases like (115), where the only presupposition that we want to suspend is the one of *stop* and not the one of *being upset* (that John left the country) or *too* (that somebody else salient left the country).

(115) If either John stopped being upset that he left the country too or he started being upset that he left the country too, he will let us know soon.

4.2) and it is not obvious to me how to reproduce these two accounts without alternatives and exhaustification.

Another point regards the fact that the present account predicts that soft presuppositions project differently from the nuclear scope and from the restrictor of universal and negative quantifiers (CHAPTER 3, SECTION 3.5). In particular, it predicts that (119a) can give rise to (119c), while (119b) cannot, in line with intuitions and the results in Chemla 2009b.

- (119) a. No student in my class stopped smoking.
 b. No student in my class who stopped smoking regrets it.
 c. Every student in my class used to smoke.

Fox (2012b) does not talk about the predictions of his system with respect to restrictors, but as far as I can see no difference is predicted between (119a) and (119b).

Finally, as Fox (2012b) observes, under downward entailing operators like negation the reading in which the presupposition is locally accommodated is marked and it is felicitous only with a continuation that forces that reading.

- (120) John didn't win the race. He didn't participated.

Under the proposal here, the markedness of (120) follows with no extra assumptions from the independently motivated minimize weakness condition, repeated in (121). The reason is that in order to suspend (120) we need to exhaustify below negation, which is vacuous, thus against the condition in (121).

- (121) **Minimize Weakness:** Do not insert EXH in a sentence S if it leads to an equivalent or weaker meaning than S without it.

Fox (2012b:p.22-23) proposes two possible conditions on the insertion of the A-operator, but they are not independently motivated like (121).³⁵

³⁵Both conditions he proposes can, however, account for another difference between the markedness of (120)

4.7 Appendix C

In this section, I first show that (124) analyzed as (125) gives rise to a contradictory meaning and then I show the same for the case of *because* in (126), with the LF in (127).

(124) Theo didn't play the guitar and drink any coffee.

(125) $\text{EXH}_i \text{EXH}_j [\neg [\text{Theo play the guitar } \mathbf{and}_j \text{ drink } \mathbf{any}_i \text{ coffee}]]$

(126) You are not mad at Peter because he broke anything

(127) $\text{EXH}_i \text{EXH}_j [\neg [\text{You are mad at Peter } \mathbf{because}_j \text{ he broke } \mathbf{anything}_i]]$

Let me simplify the notation and write (124) as the negated conjunction of (128a) and (128b), where $\{a, b\}$ stands for the domain of quantification of the NPI.

- (128) a. *Theo played the guitar* = p
 b. *Theo drank any coffee* = $\exists x_{\{a,b\}}$

We start with the exhaustification associated to *and* with respect to its scalar alternatives in (129) and we obtain (130).

$$(129) \quad \text{Alt} = \left\{ \begin{array}{l} \neg[p \wedge \exists_{\{a,b\}}] \\ \neg[p \vee \exists_{\{a,b\}}] \end{array} \right\}$$

$$(130) \quad \neg[p \wedge \exists_{\{a,b\}}] \wedge (p \vee \exists_{\{a,b\}})$$

and (122), which also needs the insertion of *A* in his account, but that doesn't need a continuation in order to be felicitous.

(122) Some of our students won.

(122) is not a problem in the present account because it does not require exhaustification and it only gives rise to the existential inference that some of our students participated. Notice that, contrary to the system in Fox (2012b), the proposal here does not predict that (122) can ever have a universal inference in (123). It is unclear to me, however, that (122) can ever give rise to the inference in (123).

(123) Each of our students participated.

We then exhaustify *any* with respect to its domain alternatives in (131), we negate them all and we obtain (132).

$$(131) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \neg[p \wedge \exists_{\{a,b\}}] \wedge [p \vee \exists_{\{a,b\}}] \\ \neg[p \wedge \exists_{\{a\}}] \wedge [p \vee \exists_{\{a\}}] \\ \neg[p \wedge \exists_{\{b\}}] \wedge [p \vee \exists_{\{b\}}] \end{array} \right\}$$

$$(132) \quad \begin{aligned} &\neg[p \wedge \exists_{\{a,b\}}] \wedge [p \vee \exists_{\{a,b\}}] \wedge \\ &\neg[\neg[p \wedge \exists_{\{a\}}] \wedge [p \vee \exists_{\{a\}}]] \wedge \\ &\neg[\neg[p \wedge \exists_{\{b\}}] \wedge [p \vee \exists_{\{b\}}]] \end{aligned}$$

(132) is equivalent to (133) and, as it is easy to see, it is contradictory. (133) is saying that Theo either played the guitar or is such that there is some coffee in a domain $D = \{a, b\}$ that he drank, but that he didn't play guitar and that there is no coffee in some subdomain $D' = \{a\}$ that he drank and there is no coffee in some subdomain $D'' = \{b\}$ that he drank.

$$(133) \quad \begin{aligned} &\neg[p \wedge \exists_{\{a,b\}}] \wedge [p \vee \exists_{\{a,b\}}] \wedge \\ &[p \wedge \exists_{\{a\}}] \vee (\neg p \wedge \neg \exists_{\{a\}}) \wedge \\ &[p \wedge \exists_{\{b\}}] \vee (\neg p \wedge \neg \exists_{\{b\}}) \end{aligned}$$

Turning to the case of *because*, I simplify the notation also here by writing as in (134a) and (134b), where $\{a, b\}$ represents the domain of quantification of the NPI.

$$(134) \quad \begin{aligned} \text{a.} \quad & \textit{Peter broke anything} = \exists x_{\{a,b\}} \\ \text{b.} \quad & \textit{You are mad at Peter} = q \end{aligned}$$

The first exhaustification with respect to the alternatives in (135) gives rise to the soft presuppositions in (136).

$$(135) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \neg[(\exists x_{\{a,b\}} \wedge q) \wedge \Box(\neg \exists x_{\{a,b\}} \rightarrow \neg q)] \\ \neg \exists x_{\{a,b\}} \\ \neg q \end{array} \right\}$$

$$(136) \quad \neg[(\exists x_{\{a,b\}} \wedge q) \wedge \Box(\neg \exists x_{\{a,b\}} \rightarrow \neg q)] \wedge (\exists x_{\{a,b\}} \wedge q)$$

We can then simplify (136) as (137).

$$(137) \quad \neg \Box(\neg \exists x_{\{a,b\}} \rightarrow \neg q) \wedge (\exists x_{\{a,b\}} \wedge q) = \\ \Diamond(\neg \exists x_{\{a,b\}} \wedge q) \wedge (\exists x_{\{a,b\}} \wedge q)$$

We can then turn to the exhaustification of the NPI with respect to the domain alternatives in (138) and the result is in (139).

$$(138) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \Diamond(\neg \exists x_{\{a,b\}} \wedge q) \wedge (\exists x_{\{a,b\}} \wedge q) \\ \Diamond(\neg \exists x_{\{a\}} \wedge q) \wedge (\exists x_{\{a\}} \wedge q) \\ \Diamond(\neg \exists x_{\{b\}} \wedge q) \wedge (\exists x_{\{b\}} \wedge q) \end{array} \right\}$$

$$(139) \quad \llbracket \text{EXH} \rrbracket (\Diamond(\neg \exists x_{\{a,b\}} \wedge q) \wedge (\exists x_{\{a,b\}} \wedge q)) = \\ \Diamond(\neg \exists x_{\{a,b\}} \wedge q) \wedge (\exists x_{\{a,b\}} \wedge q) \wedge \\ \neg[\Diamond(\neg \exists x_{\{a\}} \wedge q) \wedge (\exists x_{\{a\}} \wedge q)] \wedge \\ \neg[\Diamond(\neg \exists x_{\{b\}} \wedge q) \wedge (\exists x_{\{b\}} \wedge q)]$$

From (139) we can conclude (140) and then (141).

$$(140) \quad \Diamond(\neg \exists x_{\{a,b\}} \wedge q) \wedge (\exists x_{\{a,b\}} \wedge q) \wedge \\ [\neg \Diamond(\neg \exists x_{\{a\}} \wedge q) \vee \neg(\exists x_{\{a\}} \wedge q)] \wedge \\ [\neg \Diamond(\neg \exists x_{\{b\}} \wedge q) \vee \neg(\exists x_{\{b\}} \wedge q)]$$

$$(141) \quad \Diamond(\neg \exists x_{\{a,b\}} \wedge q) \wedge (\exists x_{\{a,b\}} \wedge q) \wedge \\ [\neg \Diamond(\neg \exists x_{\{a\}} \wedge q) \vee (\neg \exists x_{\{a\}} \vee \neg q)] \wedge \\ [\neg \Diamond(\neg \exists x_{\{b\}} \wedge q) \vee (\neg \exists x_{\{b\}} \vee \neg q)]$$

Finally, we can simplify (141) as (142), which makes it easy to see that it is a contradiction. What (142) is saying is that there is something in some domain $D = \{a, b\}$ that Peter broke and that there is nothing in some subdomain $d' = \{a\}$ that Peter broke and there is nothing in some subdomain $d'' = \{b\}$ that he broke.

$$\begin{aligned}
 (142) \quad & \Diamond(\neg\exists x_{\{a,b\}} \wedge q) \wedge (\exists x_{\{a,b\}} \wedge q) \wedge \\
 & [\neg\Diamond(\neg\exists x_{\{a\}} \wedge q) \vee \neg\exists x_{\{a\}}] \wedge \\
 & [\neg\Diamond(\neg\exists x_{\{b\}} \wedge q) \vee \neg\exists x_{\{b\}}]
 \end{aligned}$$

Chapter 5

Exhaustification as a solution to Soames' problem

5.1 Introduction

Cases like (1), (2), and (3) are problematic for all major theories of presupposition projection.¹

- (1) Nixon is guilty, if Haldeman is guilty too. (Soames 1982)
- (2) I'll go to the party, if you go too.
- (3) Mary is in the office, if John is there too.

The recipe for these problematic examples is simple: create a sentence-final conditional with “too” in the antecedent and its presupposition as the consequent. There are, in particular, three problems with these cases: the first one, which I call “the presupposition problem,” concerns the fact that (1)-(3) are felicitous and appear presuppositionless. Nonetheless, the prediction for all theories above is that they should presuppose that Nixon is guilty, that I'll go to the party,

¹(see Heim 1983, Beaver 2001, Beaver and Krahmer 2001, Schlenker 2008a, 2009, George 2008, Rothschild 2011)

and that Mary is in the office, respectively.^{2,3}

The second problem, “the truth-conditions problem,” concerns the fact that a typical way of solving the presupposition problem would be local accommodation of the presupposition in the antecedent of the conditional. However, this predicts tautological truth-conditions for cases like (1)-(3); the meanings obtained are equivalent to (6)-(8).

(6) Nixon is guilty, if both Haldeman and Nixon are guilty.

(7) I will go to the party, if you and I go to the party.

(8) Mary is in the office, if Mary and John are in the office.

The third problem, “the order problem,” has to do with the fact that there appears to be a contrast between (1)-(3) on one hand and (9)-(11) on the other.

(9) ?If Haldeman is guilty too, Nixon is guilty. (Soames 1982)

(10) ?If you’ll go to the party too, I will go.

(11) ?If John is in the office too, Mary is there.

As a solution to the presupposition problem, I propose that the presupposition of *too* is nonetheless locally accommodated in the antecedent. As we just saw, the immediate challenge is that this move gives rise to the tautological meanings in (6)-(8). In response to this second issue,

²Notice that one might think that the interpretation of (1) could be one in which we are presupposing that somebody else in the context is guilty (not Nixon). As Kripke (2009) has observed, we are not generally able to do this (cf. fn.27). Furthermore, we can exclude this reading explicitly as in (4).

(4) I don’t know whether anybody is guilty, but Nixon is guilty, if Haldeman is guilty too.

³Karttunen and Peters (1979:fn.17) suggest an account of cases like (1) in terms of *too* taking scope over the entire conditional. While this might be reasonable when *too* is located at the right edge of the sentence, it is unclear how one could generalize this idea to cases of *also* like (5), which appears in the same way felicitous (thanks to Yasutada Sudo (p.c.) for discussion on this data).

(5) I’ll go to the party, if you also go.

See also (Kripke 2009, Soames 2009) for discussion of these cases.

I argue that cases like (1)-(3) are exhaustified and this gives rise to a meaning analogous to (12)-(14).⁴

(12) Nixon is guilty, only if Haldeman is guilty too.

(13) I'll go to the party, only if you go too.

(14) Mary is in the office, only if John is there too.

As I show below, this proposal provides, among other things, a unified account of (1)-(3) and (12)-(14), the presuppositionless status of which is also problematic for many of the theories mentioned above. Furthermore, given that *if*-conditionals in general are not interpreted as *only-if* conditionals, I have to address below what mechanisms are responsible for the reinterpretation in the cases I'm focusing on. Finally, as a solution to the contrast problem, I submit that the slightly degraded status of (9)-(11) is an independent fact rooted in the relation between topic-focus structure and the position of the *if*-clause.

I implement the solution using a trivalent theory of presupposition projection, but nothing hinges on this choice.⁵ I use it because the trivalent theory is generally known and has been revived as one of the serious contenders in the recent literature. Furthermore, like other recent theories of presupposition projection, it separates clearly a basic system, which predicts symmetric projection of presuppositions and an independent mechanism for predicting asymmetric patterns of projection.⁶ This is convenient for our purposes because it provides a way to present the predictions of different mechanisms for creating the asymmetry. In particular, there are two types of approaches for making the system asymmetric: a linear order based approach and a hierarchical order based approach.⁷

⁴Thanks to Irene Heim (pc) for suggesting this strategy.

⁵(see Peters 1979, Beaver and Krahmer 2001, George 2008, Fox 2008, 2012b)

⁶The reason for this separation is the fact that the recent presupposition debate started from an attempt to explain the asymmetric part of the projection behavior of presuppositions in a more principled way than previous approaches (see Schlenker 2008a).

⁷For the former (see Schlenker 2008a, 2009, Fox 2008, George 2008, Rothschild 2011), for the latter (see Chierchia 2010), see also (George 2008) for discussion)

Sentence-final conditionals are relevant for this debate, since they are some of the few cases in which the two approaches make divergent predictions (see Schlenker 2008a, Chierchia 2010). One might think that Soames' cases can be solved by one or the other approach. In particular the contrast between the sentence-final and a sentence-initial cases, repeated below in (15a) and (15b), might suggest that a linear order based approach can fare better here.

- (15) a. Nixon is guilty, if Haldeman is guilty too.
b. ?If Haldeman is guilty too, Nixon is guilty.

The trivalent theory provides a convenient way to illustrate that this is not the case: whether we combine it with a linear or hierarchical order we make no headway on solving the problem. Furthermore, the solution I propose in the end is neutral with respect to this debate.

The chapter is organized as follows: in section 5.2, I summarize the main ingredients of the trivalent framework and discuss in detail why the presupposition is a problem for all major theories of presuppositions, in section 5.3, I outline the proposal and in section 5.4 I discuss some open issues and how to respond them. Finally, in section 5.5, sketch an alternative route to the problem and the challenges it faces.

5.2 The trivalent framework

The basic logic is trivalent, hence the domain of truth-values is expanded to include a third value, indicated as #. This third value is interpreted as uncertainty about some actual underlying truth-value of the sentence. In other words, if a sentence ϕ_p (i.e., a sentence ϕ with presupposition p) is evaluated in a world in which its presupposition p is not met we cannot tell whether it is true or false in that world.

- (16) If for some w , $p(w) = 0$ then $\phi_p(w) = \#$

Given the way we interpret the third value, we need a principle that guides us in deciding what to do when a complex sentence has arguments that are non-classically valued. In other words,

a principle that tells us how $\#$ projects. The principle that is generally adopted is the so called “Strong Kleene principle”, the definition of which is in (17).

- (17) **Strong Kleene:** If the classically-valued arguments of a connective would suffice to determine a truth value in standard logic, then the sentence as a whole has that value; otherwise it doesn’t have a classical value. (Beaver and Geurts To appear)

The principle requires us to do whatever we can with the classically valued arguments. To give a concrete example, consider the case of disjunction with a presupposition trigger embedded in one of the disjuncts, as schematically represented in (125b). The question to ask is how the non-classical value of ϕ_p projects to the whole disjunction.

- (18) q or ϕ_p

The Strong Kleene principle tells us that undefinedness projects to the whole disjunction, only when we cannot determine a classical value just by looking at the value of q . In other words, the predicted projection for (18) is the standard one in (19): if q is false, then the presupposition of ϕ_p must be true or the whole sentence is undefined.

- (19) $\neg q \rightarrow p$

That this result is a good prediction is shown by the intuitively presuppositionless status of (20a), which is indeed predicted to presuppose just the tautological (20b).

- (20) a. Haldeman isn’t guilty or Nixon is guilty too. *no presupposition*
b. If Haldeman is guilty, Haldeman is guilty.

The theory sketched up to now predicts symmetric filtering of presuppositions. It makes the same predictions for (21a) and (21b). It is not clear that this is a wrong prediction in the case of disjunction, but there are arguments for asymmetry in the literature coming from other connectives (see Rothschild 2011 for a critical discussion).

- (21) a. Haldeman isn't guilty or Nixon is guilty too.
 b. Nixon is guilty too or Haldeman isn't guilty.

Assuming that we want asymmetry, there are two main types of approaches for making a system like the trivalent theory above asymmetric: a linear order based approach and a hierarchical order based approach. As I show below, regardless of which approach one chooses, the prediction is that cases like (22a) (=1) should presuppose (22b). In other words, the presupposition problem really is a problem.

- (22) a. Nixon is guilty, if Haldeman is guilty too.
 b. Nixon is guilty.

In the following I sketch two ways of making the trivalent theory above asymmetric. Both of them essentially restrict the material that one may consider in applying the Strong Kleene Principle. The difference is whether we should base our restriction on material that comes first in terms of linear order or on material that is “lower” in a structural sense.

5.2.1 A linear order based asymmetry

I adopt (and slightly adapt) an informal principle by Beaver and Geurts's, (To appear) that describes what the linear-order based approach does. Before turning to the principle, notice that another way of formulating the Strong Kleene principle is as shown in (23).

- (23) **Strong Kleene (reformulation)**
- a. For each argument X that takes a non-classical value, check whether **on the basis of everything else in the sentence**, you can determine that assigning an arbitrary classical value to X would not have an effect on the overall value.
 - b. If so, just assign X an arbitrary value, and carry on. Otherwise, the sentence as a whole lacks a classical truth value.
 - c. If this procedure allows all non-classical values to be filled in classically, then the

sentence can be assigned a classical value.

Consider now what it means to restrict the principle above to just the material on the left in the linear order.⁸

(24) **Linear Order:**

- a. Go from left to right through the sentence. For each argument X that takes a non-classical value, check whether **on the basis of material on its left**, you can determine that an arbitrary classical value to X would not have an effect on the overall value.
- b. If so, just assign X an arbitrary value, and carry on. Otherwise, the sentence as a whole lacks a classical truth value.
- c. If this procedure allows all non-classical values to be filled in classically, then the sentence can be assigned a classical value.

To give a concrete example, consider (25), analyzed as material implication for the sake of simplicity. Imagine also that in the evaluation world w , $\phi_p(w) = \#$.

(25) if p , ϕ_p

It is clear that when we hit ϕ_p we know, looking only at material on its left, that it's not going to matter whether we assign 1 or 0 to $\phi_p(w)$. In fact, if $\phi_p(w) = \#$, then $p(w) = 0$, hence the conditional is going to be true in w no matter what the value of the consequent is.

5.2.2 Structure-based approach

To facilitate a comparison between the two approaches, we can formulate a similar informal description of the structure-based approach.

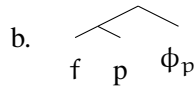
(26) **Hierarchical Order:**

⁸Sometimes this principle is called Middle Kleene, see Beaver and Geurts To appear.

- a. Proceed bottom up, following the semantic composition. For each function f and argument X , if X takes a non-classical value, check:
 - (i) whether there is a co-argument Y of f c-commanded by X
 - (ii) if there is such Y , whether on the basis of it you can determine that an arbitrary classical value to X would not have an effect on the value of $f(Y)(X)$.
- b. If so, just assign X an arbitrary value, and carry on to the next f , otherwise $f(Y)(X)$ (or $f(X)(Y)$) lacks a classical truth value.
- c. If this procedure allows all non-classical values to be filled in classically, then the sentence can be assigned a classical value.

As an example consider again (27a), and assume the structure in (27b), where f is a function associated with the conditional.⁹

(27) a. if p , ϕ_p



If we consider the function f and the argument ϕ_p , there is a co-argument of f c-commanded by ϕ_p , on the basis of which we can determine that assigning an arbitrary value to ϕ_p is irrelevant. This is because if $\phi_p(w) = \#$, then $p(w) = 0$ and the conditional is going to be true in w no matter what the value of the consequent is.

Let's go back now to the case is (28) (= 1), schematized as (29), and let us turn to see that both approaches actually make the same problematic prediction.¹⁰

⁹I am using material implication here, but the same result would be obtained with the semantics of conditionals that I discuss in section 4.2.

¹⁰As mentioned above, these two approaches make different predictions in certain instances of sentence final conditionals (see Schlenker 2008a, Chierchia 2010). Consider (28a) and (28b), schematized as (29a) and (29b). Notice that these cases are very similar to Soames', but crucially the position of the sentence with "too" and its presupposition are swapped: the latter is now in the antecedent and the former is in the consequent.

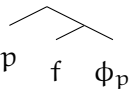
- (28) a. If Haldeman is guilty, Nixon is guilty too.
 b. Nixon is guilty too, if Haldeman is guilty.

(31) Nixon is guilty, if Haldeman is guilty too.

(32) p , if ϕ_p

5.2.3 Soames' cases are problematic no matter what

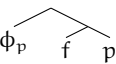
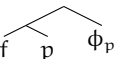
Soames' cases are problematic for the hierarchical order based approach because there is no co-argument of ϕ_p c-commanded by ϕ_p on the basis of which we could determine whether any arbitrary assignment to ϕ_p would be irrelevant. The presupposition of ϕ_p is hence wrongly predicted to project to the whole conditional.¹¹

(35) 

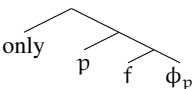
The linear order based approach does not fare better here: the projection predicted for a sentence-final conditional like (36a) is (36b).

(29) a. if p , ϕ_p
b. ϕ_p , if p

The linear-order based approach correctly predicts that (29a) should be presuppositionless. In fact, on the basis of the material on the left we can determine that giving an arbitrary value to the consequent has no overall effect on the truth-value of the whole conditional. On the other hand, in the sentence final case in (29b) there is no material on the left; the linear order approach, thus, predicts that the presupposition of ϕ_p projects to the whole disjunction. The hierarchical order predicts no difference between the two cases. In fact the antecedent is a co-argument of f and it is c-commanded by the consequent, regardless of the linear order, so we can always take it into consideration.

(30) a. 
b. 

¹¹Notice that the case of *only if* is also problematic for this approach because, wherever *only* is merged, there is no apparent reason why it should change the relevant structural relation between antecedent and consequent.

(33) 

Furthermore *only* seems to let presupposition go through in general as (34) shows.

(34) a. Only John likes his car.
b. \leadsto John has a car.

- (36) a. q , if ϕ_p
 b. $\neg q \rightarrow p$

This is because if q is true in some w , we can determine that the whole conditional is true in that world, regardless of the value of the antecedent. This means that the undefinedness of the antecedent projects to the whole conditional only if the consequent is false. Applying this to Soames' case, which has the form in (37a), the predicted presupposition is (37b), which is equivalent to (37c).

- (37) a. p , if ϕ_p
 b. $\neg p \rightarrow p$
 c. p

Crucially the linear order based theory does not predict the tautological $p \rightarrow p$, which is what we would need here to account for the presuppositionless status of (37a).

In sum, Soames' cases do not distinguish between a linear and a hierarchical order-based approach.¹²

5.3 The Proposal

5.3.1 Solving the Presupposition Problem: Local Accommodation

As mentioned, I propose that the solution to the presupposition problem is simply that the presupposition is accommodated in the antecedent. Let us first go through what this means in the trivalent framework adopted here.

The Strong Kleene principle repeated in (38) (and its modified versions based on linear or hierarchical order) tells us about how semantic undefinedness projects.

¹²Notice that while I presented it using the trivalent framework, the problem is very general and apply also to more dynamic approaches like Heim, Beaver's (1983, 2001) or pragmatic ones like Schlenker, Schlenker's (2008a, 2009) and more in general to any theory of presupposition projection, which predicts that presuppositions should project out of the antecedents of conditionals.

- (38) **Strong Kleene:** If the classically-valued arguments of a connective would suffice to determine a truth value in standard logic, then the sentence as a whole has that value; otherwise it doesn't have a classical value. (Beaver and Geurts To appear)

The question is how to connect this notion to a more pragmatic notion of presupposition, in the sense of Stalnaker (1978). Stalnaker (1978) himself suggests a way to do this, by proposing that utterances should express propositions that have a (classical) truth-value in each world of the context set. von Stechow (2008) formulates this as a felicity condition on the utterance of sentences as in (39).

- (39) **Stalnaker's bridge:** A sentence ϕ uttered in a context c is felicitous if for every world $w \in c$, $\phi(w) \neq \#$.

(39) connects semantic undefinedness and pragmatic presupposition in the sense above, as it effectively requires that the presupposition of a sentence should be entailed by the context set in which the presupposing sentence is uttered.

One question for any account of presuppositions based on contextual satisfaction is what happens when a condition like (39) is not met. A response to this question from the trivalent theory is allowing a reinterpretation of the sentence in a way that renders the presupposition part of the assertion. In order to do this, we can define an assertion operator (A operator), that works as a presupposition wipe-out tool in the system (Beaver and Krahmer 2001). I turn to this task now.

The semantics of the A operator is in (40).

- (40) $\llbracket A \rrbracket(\phi)(w)$
 $= 1$ if $\phi(w) = 1$
 $= 0$ if $\phi(w) \neq 1$

(40), together with **Stalnaker's bridge**, makes adding the A operator equivalent to asserting the presupposition; for any sentence ϕ_p , $A(\phi_p) = p \wedge \phi_p$. In a context in which Stalnaker's bridge

is not met, we have the option of reinterpreting the sentence with an *A* operator. Furthermore, the *A* operator is an operator that can be merged at any scope site in the sentence, which also raises the question about the scope position where *A* is merged relative to other operators in the sentence. Suppose a sentence like (41) is uttered in a context in which Stalnaker's bridge is not met.

(41) John doesn't drive his Ferrari to school. He doesn't want to show off.

One way to reinterpret (41) is by merging the *A* operator globally and obtaining the intuitively correct meaning in (42).

(42) $A[\neg[\text{John drives his Ferrari to school}]] = \text{John has a Ferrari and doesn't drive it to school.}$

Suppose instead that the same sentence is uttered in the same context but with a different continuation as in (43).

(43) John doesn't drive his Ferrari to school. He doesn't have one.

Here globally merging the operator would create a meaning that is in contradiction with the continuation. However, we also have the option of locally merging *A* and obtaining the meaning in (44), which is instead compatible with John not having a Ferrari: what (44) says is that either he doesn't have a Ferrari or he doesn't drive it to school.

(44) $\neg[A[\text{John drives his Ferrari to school}]] = \text{It's not true that [John has a Ferrari and drives it to school]}$

One immediate question for accounts based on repairs like the *A* operator in (40) is what the conditions that govern its use are and what the conditions that govern the choice between global and local merging are. This is a general problem and it is completely parallel to the question about global and local accommodation in the sense of Heim (1983). I come back to this issue in

section 5.2. Now that I have introduced the A -operator, let us go to back to the presupposition problem.

As mentioned above, I argue that the presupposition is locally accommodated in the antecedent. In the trivalent framework adopted here, this means merging the A operator locally, so that we interpret (45a) and (45b).

- (45) a. p , if ϕ_p
 b. p , if $A(\phi_p) = p$, if $(p \wedge \phi_p)$

An immediate concern for this approach is what to do about the tautological meaning that we obtain. This is what I called “the truth-conditions problem” above, which is the topic of the next section.

5.3.2 Solving the truth conditions problem: exhaustification

I propose that cases like (46a) are cases of exhaustified conditionals, with a meaning analogous to (46b). The meaning we obtain is thus equivalent to (47), which is obviously not tautological.

- (46) a. Nixon is guilty, if Haldeman is guilty too.
 b. Nixon is guilty, only if Haldeman is guilty too.

- (47) If Nixon is guilty, both Haldeman and Nixon are guilty

I adopt the grammatical theory of scalar implicatures presented in CHAPTER 1, based in particular on the EXH operator in (48).

$$(48) \quad \llbracket \text{EXH} \rrbracket (\text{Alt}(p))(p) = \lambda w. p(w) \wedge \forall q \in \text{Alt}(p) [p \not\leq q \rightarrow \neg q(w)]$$

Given that, as we discussed, EXH has a meaning analogous to overt *only* (i.e., (49)), in the following I adopt von Stechow (1997)’s semantics for “only if”, in order to give a compositional account of the interaction between EXH and conditionals.

$$(49) \quad \llbracket \text{Only} \rrbracket(C)(p) = \lambda w : p(w). \forall q \in C[p \not\subseteq q \rightarrow \neg q(w)]$$

This, in turn, will provide a unified account of Soames' cases with and without *only* like (50a) and (50b).

- (50) a. Nixon is guilty, if Haldeman is guilty too.
b. Nixon is guilty, only if Haldeman is guilty too.

5.3.2.1 A semantics for “only if”

I adopt von Fintel (1997)'s theory of *only if* conditionals. Again this not essential, but it gives me a concrete way to present and compute the predictions of the proposal here. The ingredients of von Fintel's (1997) account are the following: first, the LF for a case like (51a) is (51b), where GEN is an implicit universal quantifier, with the semantics in (52).

- (51) a. The flag flies only if the Queen is home.
b. Only_c [GEN [if the Queen is home] [the flag flies]]

$$(52) \quad \llbracket \text{GEN} \rrbracket(f)(p)(q)(w) = \forall w' \in f(w)[p(w') \rightarrow q(w')]$$

where f is a context dependent function that selects a modal base

Importantly, this semantics validates contraposition, which says that a conditional *if* p, q is equivalent to *if* $\neg q, \neg p$.¹³

$$(53) \quad \textbf{Contraposition: } \llbracket \text{GEN} \rrbracket(f)(p)(q)(w) \Leftrightarrow \llbracket \text{GEN} \rrbracket(f)(\neg q)(\neg p)(w)$$

Furthermore, the semantics comes with two presuppositions: a compatibility presupposition, which requires there to be antecedent worlds in the modal base and an homogeneity presupposition, which requires that either all antecedent worlds are consequent worlds or all antecedent worlds are not consequent worlds.

¹³See von Fintel 1997 for a discussion of the cases in which contraposition intuitively should not be validated.

(54) **Compatibility presupposition:** $\llbracket \text{GEN} \rrbracket(f)(p)(q)(w)$ is defined if:

$$\exists w' \in f(w)[p(w')]$$

(55) **Homogeneity Presupposition:** $\llbracket \text{GEN} \rrbracket(f)(p)(q)(w)$ is defined if:

$$\forall w' \in f(w)[p(w') \rightarrow q(w')] \vee \forall w' \in f(w)[p(w') \rightarrow \neg q(w')]$$

The homogeneity presupposition is one way of validating conditional excluded middle, which requires that *if* p , q is false then *if* p , $\neg q$ is true (see Lewis 1973b and Stalnaker 1980 for discussion).

(56) **Conditional Excluded Middle:** for any f, p, q and w ,

$$\neg \llbracket \text{GEN} \rrbracket(f)(p)(q)(w) \Leftrightarrow \llbracket \text{GEN} \rrbracket(f)(p)(\neg q)(w)$$

From here on, I simplify the notation and just write as in (57).

$$(57) \quad \llbracket \text{GEN} \rrbracket(f)(p)(q)(w) = \Box[p \rightarrow q]$$

The meaning of *only* is the one in (58) repeated from above: *only* takes a set of alternatives C and a proposition p as arguments and it presupposes the truth of p , while negating all alternatives in C that are not entailed by it.

$$(58) \quad \llbracket \text{Only} \rrbracket(C)(p) = \lambda w : p(w). \forall q \in C[p \not\subseteq q \rightarrow \neg q(w)]$$

For simplicity's sake, let us work on the case in which the alternatives in C are just the following in (59).

$$(59) \quad C = \left\{ \begin{array}{l} \Box(p \rightarrow q) \\ \Box(\neg p \rightarrow q) \end{array} \right\}$$

von Fintel (1997) provides some cases where focus on the auxiliary or on *if* might plausibly be interpreted as focus on the truth polarity of the sentence.¹⁴

- (63) It probably won't rain and
- a. the game will only be cancelled if it DOES rain.
 - b. the game will only be cancelled IF it rains.

Given the ingredients above, we can now go through the following derivation: first we compute the meaning of “only,” which presupposes the prejacent and negates the alternative $\Box[\neg p \rightarrow q]$. Next, we apply conditional excluded middle and finally we apply contraposition. The prediction is that (65a) now entails (65b).

- (64) a. $\text{Only}_c[\text{GEN}_f(p)(q)] =$
- b. $\Box(p \rightarrow q) \cdot \neg\Box(\neg p \rightarrow q)$ meaning of *only*
 - c. $\Box(p \rightarrow q) \cdot \Box[\neg p \rightarrow \neg q]$ cond excl middle
 - d. $\Box(p \rightarrow q) \cdot \Box[q \rightarrow p]$ contraposition

¹⁴von Fintel (1997) proposes a more general way to handle these cases which works both with wide and narrow focus in the antecedent. We can straightforwardly adopt it. The extra assumption needed is that in the relevant cases one of the alternatives to the antecedent is true.

- (60) $\text{Only}_c[(p[\dots]_f)(q)]$

To give an example, consider the alternatives in (61).

$$(61) \quad C = \left\{ \begin{array}{l} \Box(p \rightarrow q) \\ \Box(p' \rightarrow q) \\ \Box(p'' \rightarrow q) \end{array} \right\}$$

Assuming that in all relevant alternatives one of p , p' and p'' is true, ignoring the presupposition of the prejacent we have the following derivation.

- (62) a. $\text{Only}_c[\text{GEN}(p)(q)] =$
- b. $\neg\Box(p' \rightarrow q) \wedge \neg\Box(p'' \rightarrow q)$ mean of *only*
 - c. $\Box[p' \rightarrow \neg q] \wedge \Box[p'' \rightarrow \neg q]$ cond excl middle
 - d. $\Box[q \rightarrow \neg p'] \wedge \Box[q \rightarrow \neg p'']$ contrap
 - e. $\Box[q \rightarrow p]$ if q one of $p \dots p_n$ is true

- (65) a. The flag flies only if the Queen is home.
 b. If the flag flies the Queen is home.

The ingredients for solving the presupposition and truth conditions problems are now in place; let us go back to Soames' cases and see how we can apply them there.

5.3.3 Soames' cases again

5.3.3.1 First the *Only-if* case

Consider again the sentence in (66) (=1) and recall that the assumptions are von Fintel (1997)'s semantics and the Λ operator.

- (66) Nixon is guilty, only if Haldeman is guilty too.

We can now see that the derivation of the meaning of (67a), with LF in (67b), is (68). The derivation is analogous as above, with the only addition of the Λ operator.

- (67) a. Nixon is guilty, only if Haldeman is guilty too.
 b. $\text{Only}_c[\text{GEN}[\text{Nixon is guilty}] [\text{if } \Lambda[\text{Haldeman is guilty too}]]$
- (68) $\text{Only}_c[\text{GEN}(q, \text{if } \Lambda(p_q))]$ =
- | | | |
|----|--|------------------------------------|
| a. | $\Box(\Lambda p_q \rightarrow q) \cdot \neg\Box(\neg(\Lambda p_q) \rightarrow q)$ | meaning of <i>only</i> |
| b. | $\Box(\Lambda p_q \rightarrow q) \cdot \Box[\neg(\Lambda p_q) \rightarrow \neg q]$ | cond excl middle |
| c. | $\Box((p \wedge q) \rightarrow q) \cdot \Box[\neg(p \wedge q) \rightarrow \neg q]$ | meaning of Λ ¹⁵ |
| d. | $\top \cdot \Box[\neg(p \wedge q) \rightarrow \neg q]$ | log equiv |
| e. | $\Box[q \rightarrow (p \wedge q)]$ | contraposition |

The meaning predicted for (69a) is paraphrasable as (69b) with no presupposition. I argue that this is the right meaning for the Soames' case with overt "only."

¹⁵Remember that $\Lambda(\phi_p) = \phi \wedge p$.

- (69) a. Nixon is guilty, only if Haldeman is guilty too.
 b. If Nixon is guilty, both Haldeman and Nixon are guilty.

5.3.3.2 Now back to simple conditionals

Now, let us go back to simple conditionals like (70) (=1). It is probably clear by now that the proposal is that the sentence in (70a) is interpreted as in (70b), with a meaning analogous to (71).

- (70) a. Nixon is guilty, if Haldeman is guilty too.
 b. EXH[Nixon is guilty [if [Haldeman is guilty too]]]

- (71) Nixon is guilty, only if Haldeman is guilty too.

The idea is that it is the tautological meaning that we obtain after local accommodation that licenses a reinterpretation of the sentence with EXH. More precisely, when a sentence like (71) is uttered in a context in which the presupposition of *too* is not satisfied, we first reinterpret it with the *A* operator in the antecedent. The tautological meaning, thereby created, forces us to a second reinterpretation with the exhaustivity operator.¹⁶ The meaning of EXH that I assume is in (73).

- (73) $\llbracket \text{EXH} \rrbracket (\text{Alt}(p))(p) = \lambda w. p(w) \wedge \forall q \in \text{Alt}(p) [p \not\subseteq q \rightarrow \neg q(w)]$

The LF for (70a) becomes (74) and the derivation in (75) is completely analogous as the derivation of the case with overt *only* above. The only difference concerns the fact that the prejacent is now asserted instead of presupposed. Given that it is tautological anyway, there is no overall

¹⁶Mandy Simons (p.c.) pointed out to me that exhaustification is not a strategy that we seem to employ in response to other tautological meaning like (72).

- (72) War is war.

It's not clear to me that this is problematic. In fact, we can assume that exhaustification can be used only if there are triggered alternatives in the first place and it is not clear that with normal intonation there are alternatives to (72).

difference in meaning with respect to the sentence with overt “only”.

(74) $\text{EXH}_{\text{Alt}}[\text{GEN}[\text{Nixon is guilty, if A}[\text{Haldeman is guilty too}]]]$

(75) $\text{EXH}[\Box(\text{Ap}_q \rightarrow q)] =$

- | | | |
|----|---|------------------|
| a. | $\Box(\text{Ap}_q \rightarrow q) \wedge \neg\Box(\neg\text{Ap}_q \rightarrow q) =$ | mean of EXH |
| b. | $\Box((q \wedge p) \rightarrow q) \wedge \neg\Box(\neg(q \wedge p) \rightarrow q) =$ | meaning of A |
| c. | $\Box((q \wedge p) \rightarrow q) \wedge \Box(\neg(q \wedge p) \rightarrow \neg q) =$ | cond excl middle |
| d. | $\top \wedge \Box(\neg(q \wedge p) \rightarrow \neg q) =$ | logical equiv |
| e. | $\Box(q \rightarrow (q \wedge p))$ | contraposition |

The meaning of (76a) is predicted to be (76b), again with no presupposition. In other words, you would judge (75a) false if Nixon is guilty but Haldeman isn't.

- (76) a. Nixon is guilty if Haldeman is guilty too.
b. If Nixon is guilty, both Nixon and Haldeman are guilty.

Notice that this exhaustification reinterpretation appears to be independently motivated by non-presuppositional cases like (77) and (78).¹⁷

(77) I will go to the cinema, if you go with me/if we go together.

(78) A: What about John and Mary, do you think that they will confess the murder?

B: John will confess, if both of them will.

These cases are also predicted to be tautological, unless interpreted as exhaustified conditionals, so that the meanings are analogous to (79) and (80).

(79) I will go to the cinema, only if you go with me/only if we go together.

(80) John will confess, only if both of them will.

¹⁷Thanks to Philippe Schlenker (pc), Fabio del Prete (pc) and Brian Leahy for discussion on these cases.

Summing up, it seems that exhaustification is needed independently for treating non presuppositional cases like (77) and (78). This same strategy can be used to solve the truth-conditions problem in Soames' cases.

5.3.4 A solution to the order problem

Recall that Soames (1982) argues that there is a contrast between (81a) and (81b).

- (81) a. Nixon is guilty, if Haldeman is guilty too.
b. ?If Haldeman is guilty too, Nixon is guilty.

It has been claimed in the literature that whether a conditional clause is in initial or in final position depends on its discourse status as being in the background or in the foreground (Givón 1982 and von Stechow 1994). What is relevant for us is the observation that the sentence-initial position is dispreferred when the if-clause contains new information. An example that shows this preference is the contrast in (82a) and (82b).

- (82) Under what conditions will you buy this house? (von Fintel 1994)
- a. I'll buy this house if you give me the money.
- b. #If you give me the money I'll buy this house.

EXH needs focus on the antecedent to have the alternatives that gives rise to the exhaustification with the meaning of an “only if” conditional. Assume, further, a question-answer congruence principle for focus along the lines of (83) (Rooth 1996) and the notion of Question Under Discussion (QUD) which stands for the explicit or implicit main question in the discourse (see Roberts 2004, Beaver and Clark 2009).

- (83) The focus of the answer corresponds to the questioned position in the wh-question.

It follows that the focus in a sentence like (84), in turn, requires a question under discussion along the lines of (85).¹⁸

(85) ?If [Haldeman is guilty too]_F, Nixon is guilty

(86) Under what conditions is Nixon guilty?

This, however, is precisely the situation that the generalization above says it is degraded, thus we account for the dispreference for sentence initial conditionals like (85).¹⁹ Notice that we are not predicting that the sentence-initial case with “too” should be completely impossible, but only that it should be dispreferred in comparison to the sentence-final one. I argue that this prediction is correct, as most of my informants find the sentence-initial case possible, although they prefer the sentence-final one.

5.3.5 Summing up

I argued that a conditional like (88a) has the LF in (88b) and the meaning in (89).

(88) a. Nixon is guilty, if Haldeman is guilty too.

b. $\text{EXH}_{A\text{lt}}[\text{GEN}[\text{Nixon is guilty, if } A[\text{Haldeman is guilty too}]]]$

(89) If Nixon is guilty, both Haldeman and Nixon are guilty.

¹⁸Notice that as a reviewer points out focus is also needed on Haldeman, as that associates with *too*. The structure is as in (84): the first focus on Haldeman associates with *too*, while the second focus on the entire antecedent including the A-operator, associates with EXH.

(84) $\text{EXH}[\text{if } [A[[\text{Haldeman}]_F \text{ is guilty too}]]_F \text{ Nixon is guilty}]$

¹⁹It is easy to show that without the alternatives of the antecedent we do not get the meaning of “only if”. Consider a focus structure in which the focus is on “Nixon” in the consequent. Assuming that we first locally merge the A, we can only obtain the negation of alternatives of the form “x is guilty, if Haldeman and Nixon are guilty”. The meaning obtained is thus that if both Haldeman and Nixon are guilty, nobody else relevant is guilty. Though this might be a possible reading of the sentence, this is certainly not the primary reading.

(87) $[\text{Nixon}]_F \text{ is guilty, if Haldeman is guilty too}$

I have also argued that the contrast between (90a) and (90b) is attributable to the focus structure of sentence-final/initial conditionals.

- (90) a. Nixon is guilty, if Haldeman is guilty too.
 b. ?If Haldeman is guilty too, Nixon is guilty.

The approach here predicts no presupposition problem given the assumption of local accommodation in the antecedent and no truth-conditions problem, as the meaning predicted is not tautological. Furthermore, it provides a unified account of sentence-final conditionals and only *if* conditionals with a trigger in the antecedent like (91).

- (91) Nixon is guilty, only if Haldeman is guilty.

Finally, it can also account for related non-presuppositional cases like (92).

- (92) I'll go to the cinema, if we go together.

5.4 Open Issues & Extensions

In the following, I discuss four open issues and how to respond to them. First, I've claimed that certain cases of *if*-conditionals are really interpreted as *only if*-conditionals, and one may take issue with that. Second, it has been claimed in the literature that triggers like *too* cannot be locally accommodated (Chemla and Schlenker To appear), so why would it be possible here? Third, I have only talked about *too*, what about other triggers? Finally, what about other quantificational structures, in particular ones for which conditional excluded middle cannot be assumed? I turn to each of these issues in the next sections.

5.4.1 Differences with “only-if” and the pragmatics of EXH

5.4.1.1 Differences

I have argued that (93a) means (93b); in other words, it is false if Nixon is guilty but Haldeman isn't.

- (93) a. Nixon is guilty, if Haldeman is guilty too.
 b. If Nixon is guilty, both Haldeman and Nixon are guilty.

To give another example, imagine a context in which we were about to enter the door of our house and I say (94). Then I open the door and Mark is there but Bill isn't. The question is whether, in that context, I said something false, as the present proposal predicts.

- (94) Mark is here, if Bill is here too.

Instead of relying just on our intuitions about (94), we can ask whether there are differences between (95a) and (95b), as a contrast would be an argument against the meaning proposed here.²⁰

- (95) a. John will go to the movies, only if Mary goes too.
 b. John will go to the movies, if Mary goes too.

There appear, in fact, to be cases in which (95a) and (95b) differ, in particular when we add a continuation that is incompatible with the *only-if* meaning.

- (96) a. John will go to the movies, only if Mary goes too. #But if there is a movie with George Clooney, he will go whether Mary goes or not.
 b. John will go to the movies, if Mary goes too. But if there is a movie with George Clooney, he will go whether Mary goes or not.

²⁰Thanks to Brian Leahy, Bernhard Nickel and David Beaver for extremely helpful discussions of the data discussed here.

The difference between Soames' cases with and without "only" is not *prima facie* predicted by the present proposal. Notice that cases like the above are also possible with non presuppositional cases like (97) and (98), so a response is needed independently from Soames' cases.

(97) I will go to the cinema, only if we go together. #But if there is a movie with George Clooney, I'll go whether you go or not.

(98) I will go to the cinema, if we go together. But if there is a movie with George Clooney, I'll go whether you go or not.

Notice, also, that I am not committed to the claim that a case like (93a) is always interpreted as (93b). The proposal is that one way to avoid attributing a tautological meaning to what the speaker said is re-interpreting it exhaustively. It is compatible with the proposal that the tautological meaning can be also avoided in other ways in certain cases (cf. fn 24). In the next section, I explore one such strategy and show that we can, in fact, account for such differences on pragmatic grounds.²¹

²¹Bernhard Nickel (p.c.) also make the following two objections to the meaning predicted here: first, he points out that there is a contrast between (99) and (100)

(99) John goes, only if Mary goes too. But even if Mary goes, John might not go.

(100) John goes, if Mary goes too. #But even if Mary goes, John might not go.

To my ears, there is a felicitous reading of (100). However, the contrast needs to be accounted for and I leave this open for now. Furthermore, the fact that (100) may sound ok to some speakers, could be because this is a case of suspension of entailed material like (101), which Beaver and Clark (2009) describe as the pragmatic strategy of "letting the hearer down gently".

(101) This ones for hardcore fans ... and maybe not even them.

The second objection regards the following reasoning in (102), which seems intuitively a good argument.

(102) a. John goes, if Mary goes too.
b. Mary goes.
c. Therefore, John goes.

(102c), however, is not predicted to follow from (102a) and (102b) in the present proposal. This is I am proposing that (102a) means (103).

5.4.1.2 The pragmatics of EXH

As discussed in CHAPTER 1, the grammatical theory of scalar implicature embodies a proposal to draw the line between semantics and pragmatics differently than in Gricean and Neo-Gricean accounts. In particular, Fox (2007) divides the labor between semantics and pragmatics as follows: scalar implicatures are derived as entailments of exhaustified sentences, they are completely on the semantic side, while ignorance inferences about the speaker are derived pragmatically. More specifically, the latter are derived by reasoning about the speaker's mental state, as in the (neo)-Gricean accounts, in accordance with a maxim of quantity along the lines of (105) (adapted from Fox 2007).

- (105) **Maxim of Quantity:** If S_1 and S_2 are both relevant to the topic of conversation and S_2 is not more informative or equivalent to S_1 , if the speaker believes that both are true, the speaker should utter: (i) S_1 rather than S_2 , if S_1 entails S_2 or (ii) both S_1 and S_2 , if they are logically independent.

Notice that (105) is not restricted to alternatives allowing us to (only) conclude that the speaker is ignorant about every relevant proposition that isn't entailed by the assertion.²² By way of illustration consider the sentence in (107a): (107a) can be read with the scalar implicature in (107b) or with the ignorance inference in (107c). The idea is that the former is derived

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- (103) If John goes, Mary goes.

The question here is whether intuitively one wouldn't normally also assent to the argument in (104) with overt *only*, given its being a sufficiently reasonable argument, despite its not being logically valid. I leave this question for further exploration.

- (104) a. John goes, only if Mary goes too.
b. Mary goes.
c. Therefore, John goes.

²²A maxim of quantity non-restricted to alternatives allows us to derive only ignorance inferences because of the so-called "symmetry problem". In brief, the problem is that every time you consider a more informative and relevant proposition p for any asserted proposition q , also the more informative $q \wedge \neg p$, must also be relevant, given reasonable assumptions about relevance. However, if we assume that the speaker both doesn't believe p and he doesn't believe $q \wedge \neg p$ we obtain that she is ignorant about p . (see Fox 2007 and Chierchia et al. To appear for discussion).

by exhaustification, while the latter is derived by reasoning in accordance with the maxim of quantity in (105).²³

- (107) a. Some student came.
 b. Not every student came.
 c. The speaker is ignorant as to whether all student came.

In case of a continuation that is incompatible with (107b) like the one in (108), an obvious strategy for this approach would be to say that (107a) is simply interpreted without exhaustification. In other words, it is read with the weak inference in (107c), which is compatible with the continuation.

- (108) Some student came. In fact, maybe even all of them did.

Can we apply the same strategy to the case of (109), repeated from above?

- (109) John will go to the movies, if Mary goes too. But if there is a movie with George Clooney, he will go whether Mary goes or not.

I propose that we can and that this is precisely what happens in the case of (109): when we reach the continuation that is incompatible with the exhaustification of the first part, we simply re-interpret the first sentence without EXH. Notice, though, that in the case of (109), this cannot be the whole story, because if we just interpret the first part without exhaustification, we wind up with the tautological meaning in (110).

- (110) John will go to the movies, if Mary and John go.

²³(107b) is obtained via assuming the LF in (106a) and the alternatives in (106b).

- (106) a. EXH[some student came]
 b. {some student came, every student came}

Indeed, I argued above that the tautological meaning is what triggers exhaustification. Now, however, I am proposing that in the case of a continuation that is incompatible with this exhaustification we do not exhaustify. The question, hence, is how in these cases we deal with the tautological meaning. I argue that we should look at the pragmatic inferences of (110) obtained by reasoning in accordance to the maxim of quantity in (105), and that these are enough to account for the meaning of (109). In particular, the meaning that we obtain could be paraphrased as (111), which is a coherent and plausible meaning for (109).

(111) It's possible that if John goes to the movies, both Mary and John go. But if there is a movie with George Clooney, he is going whether Mary is going or not.

Let us now go through how we obtain (111): (105) tells us that the speaker is ignorant about all relevant propositions that are not entailed by the assertion. We obtain, in particular, that the speaker is ignorant about (112).

(112) John will go to the movies, if not both Mary and John go.

What does it mean that the speaker is ignorant about (112)? It means that we can conclude (113a) and (113b).

- (113) a. It's possible for the speaker that it's true that if not both Mary and John go, then John goes.
- b. It's possible for the speaker that it's false that if not both Mary and John go, then John goes.

This, in turn, means that, from (113b), we can go through the derivation in (114), using conditional excluded middle and contraposition as before, and conclude (121d), thus we obtain the meaning in (111), which is not contradictory.²⁴

²⁴To illustrate that (111) is coherent, we have to first look at the interpretation of (121d). If the conditional is an epistemic conditional, that is it quantifies over the belief state of the speaker, I argue that the way we should formalize it is (114): the speaker considers possible that if John goes, Mary and John go.

- (121) a. It's possible for the speaker that it's false that if not both Mary and John go, then John goes.
- b. It's possible for the speaker if not both John and Mary go, John doesn't go conditional excluded middle
- c. It's possible for the speaker that if John goes, Mary and John go. contraposition
- d. It's possible for the speaker that if John goes, Mary goes. log equiv

I argue that a sentence like (122) can have the strong reading in (123a), obtained via the insertion of EXH, or the weak reading in (123b), in turn obtained via pragmatic reasoning in accordance

(114) $\Diamond[p \rightarrow q]$

This is parallel to the cases in which an overt epistemic possibility modal is present in the assertion, like in (115), which is also to be formalized as (114).

(115) Maybe if John goes, Mary will go.

In the case of a generic conditional like (116), we would, instead, formalize it as (117), where \Diamond and \Box range over different modal bases.

(116) Maybe the kids play soccer, if the sun is shining.

(117) $\Diamond\Box[p \rightarrow q]$

We also have to look at the contribution of the unconditional *whether or not* in the continuation. For our purposes, I simply assume that *whether or not-p, q* should be formalized as (118a). (118a) is equivalent to (118b), but given the **compatibility presupposition** it also requires that in the domain of quantification there is a world in which p and a world in which $\neg p$ (see Rawlins 2008 for a more sophisticated analysis of unconditional, which is, however, compatible with the present proposal).

- (118) a. $\Box[p \rightarrow q] \wedge \Box[\neg p \rightarrow q]$
 b. $\Box q$

Putting these two things together, I propose that the way to formalize (119) is (120a), which is coherent and equivalent to (119b), with the presupposition that there is a world in the modal base in which there is a movie with George Clooney and Mary goes and one in which there is a movie with George Clooney and Mary doesn't go.

(119) It's possible that if John goes, Mary goes. But if there is a movie with George Clooney, John goes whether or not Mary goes.

- (120) a. $\Diamond[p \rightarrow q] \wedge \Box[(r \wedge \neg q) \rightarrow p] \wedge \Box[(r \wedge q) \rightarrow p]$
 b. $\Diamond[p \rightarrow q] \wedge \Box[r \rightarrow p]$

with (105). The latter reading is used, in particular, when the first one is incompatible with either a continuation of the sentence or information in the context.

(122) John goes, if Mary goes too.

- (123) a. If John goes, Mary goes.
b. It's possible that if John goes, Mary goes.

In the case of overt “only” repeated in (124), on the other hand, of course there is no option of interpreting the sentence without “only”, thus contradiction is bound to arise.^{25,26}

²⁵To illustrate, we formalize the meaning of (131) as (124a). This is equivalent to (124b) but it introduces the compatibility presuppositions that there is a world in which r and $\neg q$ (cf. fn. 23). Given the second conjunct, however, that world must also be a p -world, which means that this world falsify the first conjunct, as it is a world in which p and $\neg q$.

- (124) a. $\Box[p \rightarrow q] \wedge \Box[(r \wedge \neg q) \rightarrow p] \wedge \Box[(r \wedge q) \rightarrow p]$
b. $\Box[p \rightarrow q] \wedge \Box[r \rightarrow p]$

²⁶An anonymous reviewer points out that a sentence like (125) is felicitous and asks whether this is not a problem for the present approach.

(125) I'll go, whether you go too or not.

Let me show that (125) is not a problem: I analyze (125) to as (126a), which is equivalent to (126b), but that also introduces the compatibility presuppositions that in the modal base there is at least a world $p \wedge q$ and a world $p \wedge \neg q$ (cf. fn. 23)

- (126) $\Box[(p \wedge q) \rightarrow p] \wedge \Box[\neg(p \wedge q) \rightarrow p]$
(126) $\Box p$

(125) is, hence, not tautological and just means that I will go, while presupposing that it's possible that you come and that you don't come. In other words, in this case we do not need to exhaustify to obtain a tautological meaning after local accommodation.

This strategy helps also with another question of the same reviewer about cases like (127).

(127) Nixon is guilty, even if Haldeman is guilty too.

An indicative *even-if* conditional like (127) appears to have a *whether or not* interpretation. In other words, it appears to entail the consequent (Barker (1994)). I submit that the meaning we want to obtain for (127) is that Nixon is guilty and that it's possible that both Haldeman is guilty and that it's possible that Haldeman isn't guilty. Assuming a simplified version of *even-if* conditionals, which says roughly that *p, even if q* means that *p, if q* and *p, if not-q*, we would predict that (127) is not tautological and means (128a), which is equivalent to (128b), and that presupposes (128c) and (128d) (see Barker (1994) for discussion and a more sophisticated version of this analysis).

- (131) John will go, only if Mary goes too. #But if there is a movie with George Clooney, he will go, whether or not Mary goes.

In sum, we can account for certain differences between Soames' cases with and without overt "only", if we look at their pragmatic inferences.

5.4.2 *too* and accommodation

5.4.2.1 Is local accommodation possible or not?

It is claimed in the literature that triggers like *too* are very hard, if not impossible, to locally accommodate.²⁷ Chemla and Schlenker (To appear) discuss the case in (133).

- (133) #I talked to Ann. It's impossible that John *too* will come. Ann is abroad.

The question is why (133b) cannot mean that it is impossible that both John and Ann will come because Ann is abroad. This would be exactly the meaning that we would obtain if we could

-
- (128) a. Nixon is guilty, if Haldeman and Nixon are guilty and Nixon is guilty if not both Haldeman and Nixon are guilty
 b. Nixon is guilty
 c. it's possible that Nixon and Haldeman are guilty
 d. it's possible that not both Nixon and Haldeman are guilty

Putting it all together, the meaning we obtain is that Nixon is guilty and that it's possible that Haldeman is guilty and that it's possible that he isn't, which is precisely the meaning that we wanted to obtain above. Notice that, as in the case of *whether or not*, we do not need to exhaustify. This fact also accounts for the observation that overt "only" cannot occur with "even" in cases like (129) and with *whether or not* as in (130).

- (129) Nixon is guilty, (*only) even (*only) if Haldeman is guilty too.

- (130) Nixon is guilty, (*only) whether (*only) Haldeman is guilty too or not.

²⁷Triggers like *too* are also assumed to be impossible to accommodate globally. Kripke (2009) shows that an example like (132) is infelicitous in a context in which there is no salient individual that satisfies the predicate.

- (132) ??Sam is having dinner in New York tonight, too.

In response to this data, it has been claimed that *too* has an anaphoric component that needs a salient entity in the context (Heim (1992) and Kripke (2009)). The lack of global accommodation can be traced back to the absence of a salient anaphoric reference. Notice that in Chemla and Schlenker (To appear)'s case the first sentence provides a salient entity in the context.

locally merge the A operator.

- (134) It's impossible [A[that John too will come]]. = It's impossible that [Ann will come and John will come]. Ann is abroad.

More to the point, why can't we insert an A locally in (133b) and we can in Soames' cases? Chemla and Schlenker (To appear) propose a semantics for *too* based on contrastive focus. As I discuss in the next section, their analysis can account for why it is not possible to locally accommodate in their case above and it is possible instead in cases like Soames'.²⁸

5.4.2.2 A semantics for *too*

Chemla and Schlenker (To appear)'s analysis of *too* has the following characteristics: (i) *too* is a focus sensitive particle that requires a clausal antecedent (ii) the clausal antecedent has to be presupposed to be true (iii) the clausal antecedent has to entail a member of the focus value of the clause containing *too*. For illustration consider a case like (135), adapted from Rooth (1992): the requirement is that a member of the focus value of [HE insulted HER] is entailed by the antecedent clause [Mary insulted John] (the antecedent of *too* will be indicated with co-indexation).²⁹

- (136) [Mary insulted John]_i, and then HE insulted HER too_i.

²⁸Notice that, as they discuss, this runs against their own assumption that *too* is impossible to locally accommodate. Thanks to Philippe Schlenker (p.c.) for pointing this to me and for extensive and extremely helpful discussion on this part of the chapter.

²⁹More formally, the analysis of *too* is the following in (135) (where $\llbracket \cdot \rrbracket_f$ and $\llbracket \cdot \rrbracket_o$ are the focus and ordinary value, respectively, see Rooth 1992)

- (135) $\llbracket \text{too}_i \text{ IP} \rrbracket^{g,w}_o = \#$ unless
- a. $g(i)$ denotes a proposition that is true at w
 - b. for some proposition p in $\llbracket \text{IP} \rrbracket^{g,w}_f$
 - (i) p is an alternative distinct from $\llbracket \text{IP} \rrbracket^{g,w}_o$
 - (ii) relative to the context set, $g(i)$ entails p
if $\llbracket \text{too}_i \text{ IP} \rrbracket^{g,w}$ is defined then it is equal to $\llbracket \text{IP} \rrbracket^{g,w}$

The case in (136) is straightforward; consider now a slightly more sophisticated case like (137). (137) is felicitous as long as we globally accommodate that *if Mary called John a republican, she insulted her*.

(137) [Mary called John a republican]_i, and then HE insulted HER too_i.

This is derived by Chemla and Schlenker (To appear)'s analysis. In fact, the requirement is that the antecedent entails a member of the focus alternatives of the clause [HE insulted HER]. The alternatives are of the form *x insulted y*, where for (137) *x* and *y* are resolved to Mary and John, respectively. Then, [Mary called John a republican] entails that [Mary insulted John] if we accommodate that *if Mary called John a republican, then she insulted him*.

Notice that allowing global accommodation of conditionals like the above, would massively overgenerate. In fact, it is in principle possible with any antecedent, unless some economy condition is postulated. Chemla and Schlenker (To appear) propose the constraint in (138).

(138) **Role of the antecedent.** The antecedent clause of *too* plays a role in satisfying the presupposition it triggers. More precisely, the presupposition which is accommodated when *i* denotes this antecedent should not be equivalent to the presupposition that would have to be accommodated in its absence, i.e. if *i* denoted the context set.
Chemla and Schlenker (To appear:p.14)

To illustrate the role of (138), they discuss the contrast between (139) and (140).

(139) [Mary is eating popovers]_i, and John too_i is overeating.

(140) [Mary is drinking Bordeaux]_i, and John too_i is overeating.

In both (140) and (139) the clausal antecedent entails the clause containing *too* if we accommodate the conditionals *if Mary is eating popovers, she is overeating* and *if Mary is drinking Bordeaux, she is overeating*. The former case, however, appears unproblematic, while the latter

is quite hard in absence of further information in the context. Their intuition is that if one is willing to accommodate (140), then this is probably because one already believes the consequent, i.e. *that Mary is overeating*. But if this is the case, then the antecedent plays no role in the satisfaction of the presupposition and this is precisely what (138) disallows.

5.4.2.3 Back to local accommodation

Contrary to Chemla and Schlenker (To appear) I am assuming that local accommodation is possible with *too*.³⁰ The idea is that once we adopt their analysis of *too* and the economy condition in (138), we can account for the infelicity of (133) as a violation of (138), without assuming that it is due to an impossibility of local accommodation. In fact, *too* needs a clausal antecedent and this forces global accommodation of the conditional *if I talked to Ann, she is coming to the party* and one would do this presumably only if one already believes that *Ann is coming to the party*. However, this leads to a violation of (138).

Soames' cases, on the other hand, are such that the consequent can be the anaphoric antecedent for *too*, so no such problem arise and we can locally accommodate.³¹

³⁰As Chemla and Schlenker (To appear) discuss a resulting prediction is that sentences like (141) and (142) should be felicitous. In my intuitions, (141) is felicitous, while (142) is more degraded. I leave this as an open problem here.

(141) John wonders whether Mary will come to the party. But its clear that if Peter comes too, the evening will be highly entertaining.

(142) ?John doubts that Mary will come to the party. But its clear that if Peter comes too, the evening will be highly entertaining.

Notice that (142) also raises a question about the status of “too” with respect to the soft-hard distinction discussed in CHAPTER 3 and 4, at least in the case we use the explicit ignorance test as diagnostic. In particular, (142) suggests that *too* would be more similar to soft triggers than generally thought. On the other hand, as we discussed the presupposition of “too” appears to project differently from the ones of soft triggers in quantificational sentences. I leave a further exploration of this issue for future research.

³¹One might ask why we cannot globally accommodate in Soames' cases. I believe this relates to the generalization in (143) proposed by Katzir and Singh (To appear) (see also Gazdar 1979).

(143) **Ignorance Inferences Block Accommodation:** Accommodation of a proposition *p* is disallowed if doing so would contradict an earlier ignorance inference that the speaker is ignorant about *p*. (Katzir and Singh To appear)

Katzir and Singh To appear provide examples like (144) in support of (143).

(147) [Haldeman is guilty]_i, if Nixon is guilty too_i

5.4.3 Other Triggers

We saw that triggers like *too* can give rise to Soames' cases. *also* can be used to create analogous cases.

(148) Nixon is guilty, if Haldeman is also guilty.

We might be able to create these cases with *again*, as in (149a).

(149) Suppose we are at the beginning of the season, Shaq has just came to Boston and we are at the second game

- a. I don't know if Shaq played yesterday, but
(?)He played yesterday, if he plays again today.

However other triggers appear to be non felicitous in this configuration.

(150) ?Mary used to smoke, if she stopped.

(151) ?Mary is in New York, if John discovered that she is there.

(152) ?Somebody killed Mary, if it was the butler.

(144) If Lyle flies to Toronto, he has a sister. #His sister is from Montréal.

The proposition that Lyle has a sister is the consequent of the conditional thus the speaker implies that she is ignorant about it (Gazdar 1979). The idea is that the speaker cannot go on and require the hearer to accommodate the same information that she implied to be ignorant about. Soames' cases provide a similar situation: we have a proposition that is both the presupposition to be accommodated and the consequent of the conditional.

(145) p , if ϕ_p

What we would get if we were to globally accommodate would simply equivalent to p .

(146) $A(p, \text{if } \phi_p) = p \wedge (p, \text{if } \phi_p)$

However, the speaker has just implied that she is ignorant about p , so there is a clash and p cannot be globally accommodated.

This might suggest that we are dealing with a specific phenomenon linked to additives. Notice, though, that in those cases the correspondent overt *only if* conditionals are also infelicitous.

(153) ?Mary used to smoke, only if she stopped.

(154) ?Mary is in New York, only if John discovered that she is there.

(155) ?Somebody killed Mary, only if it was the butler.

There appears to be some yet to be explained factor that makes also overt *only if* weird in these configurations. In these cases we have a tautological meaning that triggers exhaustification, however, the sentences remain weird as the overt *only* examples show. The present proposal predicts that to the extent that one can create a context in which the sentence with *only if* is felicitous, so will be the sentence final conditional without *only*. If the weirdness is both with conditionals and only-if conditionals, those cases might not tell us much about the Soames' problem.

5.4.4 Quantificational cases

Given the treatment above, we expect to find analogous cases with generic and quantified sentences.

5.4.4.1 Generics

In the case of generics, we can straightforwardly adopt von Stechow (1997) proposal, which extend to *only* in generics. The only modification is generalizing the meaning of GEN so that it can quantify over predicates.

- (156)
- a. Only professors are confident.
 - b. Only_c[GEN[professors] [are confident]]
 - c. All confident people are professors.

The question is whether we can create cases analogous to Soames' ones with generics or habituals. I argue that we can: although in English these cases sound a bit funny, in Italian, where subjects can appear easily post-verbally, these examples sound natural.

- (157) a. (?) Only professors that are also confident are tall.
b. (?) Professors that are also tall are confident.

- (158) Sono bravi i professori che sono anche ben vestiti.
are good the professors that are also well dressed

The problem is the same, the meaning predicted for (158) is tautological, something we can paraphrase as (159). If we apply von Stechow (1997)'s semantics we obtain the non-tautological meaning in (160).

- (159) Professors that are well-dressed and good are good.

- (160) Professors that are good are good and well-dressed.

Summing up, the proposal here can be extended straightforwardly to cases of generics that are analogous to Soames' cases.

5.4.4.2 Overt quantifiers

The case of overt quantifiers is more complicated. Consider (161), with focus on the entire restriction.

- (161) Yesterday, I met every [student that you also met]_f

The problem is that here we do not have conditional excluded middle. In fact, if (162a) is true it certainly does not follow that (162b) also is.

- (162) a. Not every student came
b. Every student didn't come

Notice, however, that this is a problem also for cases with overt “only”, as shown by (163), so we need an independent solution for that as well. For cases in which the focus is on the entire restrictor, von Stechow (1997:p.43) proposes a solution expanding the domain of alternatives; a solution that we can adopt here.

(163) Yesterday, I only met every [student that you also met]_f

5.5 An sketch of an alternative approach

I have proposed an account of Soames’ cases in terms of local accommodation and exhaustion. I have talked about some open issues and some possible responses. If you are still dissatisfied, I sketch a different approach you might try and some problems you should solve.

5.5.1 Back to the relation between presupposition and truth-conditions problem

I talked about the truth-conditions problem as caused by local accommodation. There is, however, a further complication: suppose we have a mechanism to cancel the presupposition requirement altogether. Even so, the problem would remain because most theories make the assumption in (164). Hence, given that the presupposition is locally entailed, if we forget about the presupposition, the meaning for (165a) is still (165b).

(164) **Presuppositions are locally entailed:** Every presupposition is also an entailment of the minimal sentence that carries it.

- (165) a. Nixon is guilty, if Haldeman is guilty too.
b. Nixon is guilty, if Haldeman and Nixon are guilty.

Let’s consider dropping the assumption in (164). In fact, there are proposals in the literature that do not make that assumption at all, DRT being an example of it (van der Sandt 1992, Geurts 1999). Another proposal in the literature, Klinder 2010, drops (164) selectively for “hard triggers”, which include *too* (cf. CHAPTER 3 and 4). Let us go through what it would mean to

adopt this strategy in very general terms for Soames' cases.³²

Assume that at least in the case of *too* (164) does not hold and assume that in certain cases we can cancel the presupposition of *too* altogether. This would provide a solution for the truth-conditions problem in Soames' cases, as (166a) now simply means (166b), which is obviously non-tautological.

- (166) a. Nixon is guilty, if Haldeman is guilty too.
 b. Nixon is guilty, if Haldeman is guilty.

Furthermore, we would have no problem with other triggers if we assume with Klinedinst 2010 that only strong triggers do not entail their presuppositions. We expect a tautological meaning for soft triggers like *stop* and this can explain the infelicity of (167).

- (167) ?Jane used to smoke, if she stopped.

We would also have no problem with other quantifiers like *every* in cases like (168a), which would end up meaning just (168b).

- (168) a. I read every book that Mary also reads.
 b. Every book that Mary reads I read.

Finally, the fact that the continuation in (169a) is felicitous and the one in (169b) is not would be accounted for. Similarly the argument in (170) would also be accounted for.

- (169) a. John goes, if Mary goes too. But if there is a movie with George Clooney, John goes, whether or not Mary goes.

³²Notice that in a standard trivalent framework it is impossible to have a presupposition that is not entailed by the minimal sentence containing it. This is because if ϕ_p is any value different from the third value, then p must be true; hence, if ϕ_p is true, then p must be true. However Klinedinst (2010) shows that we can reinterpret # in a way that is compatible with the assumption above (see also Fox 2008). The idea is to interpret # as "unassertable", which is not incompatible with the value of the sentence being true or false. This goes back to the idea of assuming that presuppositions live on a different dimension than truth-conditional meaning (Gazdar 1979, Karttunen and Peters 1979). As Klinedinst (2010) shows there is no obvious explanatory loss by doing this move. I cannot go in detail here, see Klinedinst 2010 for discussion.

- b. John goes, if Mary goes too. #And even if Mary goes, John might not go.
- (170)
- a. John goes, if Mary goes too.
 - b. Mary goes.
 - c. Therefore, John goes.

Summing up, this strategy would make good predictions with respect to the presupposition and truth-conditions problem and can also solve some of the open issues for the other approach above. However, it also has its own problems, to which I now turn.

5.5.2 Open Issues

An immediate question for this account is why (171a) cannot be felicitous if it just means (171b) and the presupposition is cancelled in the antecedent? The same question arises for a quantifier case like (172a), which should just mean (172b).

- (171) a. ??Nixon isn't guilty, if Haldeman is guilty too.
 - b. Nixon isn't guilty, if Haldeman is guilty.
- (172) a. ??I didn't read every book that Mary also read.
 - b. Every book that Mary read, I didn't read.

Notice that these are not problematic for the previous approach above. For instance in the case of (171a), the meaning we would get after local accommodation is (173), which is equivalent to the negation of the antecedent, thus its infelicity is predicted.³³

- (175) Nixon isn't guilty, if Haldeman and Nixon are guilty.

³³If we exhaustify we obtain the meaning in (173). (173) is equivalent to (174), which is the negation of the consequent of the original sentence, thus again it is predicted to be infelicitous (cf. fn.31)

- (173) If Nixon isn't guilty, Haldeman and Nixon are guilty.
- (174) Nixon is guilty.

Another problem is a case raised by Rooth (1992). The question is why do (176a) and (176b) feel intuitively different? In fact, if the presupposition of “too” can just be cancelled with A_k and it is not locally entailed, they should just mean the same thing. However B is a perfect response to A, while B’ sounds vague and non-related to A.

(176) A: John is in the elevator.

- a. B: If Mary were in the elevator too, the weight limit would be violated.
- b. B’: ?If Mary were in the elevator, the weight limit would be violated.

Finally a problem arises when we turn to non presuppositional cases like (177). The question is what is the meaning here? If we want to obtain the meaning in (178), how do we obtain it?

(177) I go, if we go together.

(178) I go, if you go

In sum, I have outlined an alternative approach to Soames’ cases. While it can resolve straightforwardly certain open issues of the previous approach, it has its own problems to solve. I leave for future research a more in depth exploration of this alternative strategy.

Chapter 6

Which Alternatives? Under- and Over-generation in Scalar Reasoning

In this thesis, I have adopted the grammatical theory of scalar implicatures presented in CHAPTER 1, based on the exhaustivity operator in (2).

$$(1) \quad \llbracket \text{EXH} \rrbracket (\mathcal{Alt}(\phi))(\phi) = \lambda w. \phi_w \wedge \forall \psi \in \mathcal{Excl}(\phi) [\neg \psi_w]$$

In presenting the notion of excludable alternatives, I have proposed to move from the standard (2), which excludes all alternatives stronger than the assertion, to (3), which also excludes alternatives logically independent from it.

$$(2) \quad \mathcal{Excl}_{st}(\phi) = \{\psi \in \mathcal{Alt}(\phi) : \psi \subset \phi\}$$

$$(3) \quad \mathcal{Excl}_{nw}(\phi) = \{\psi \in \mathcal{Alt}(\phi) : \lambda w [\neg \psi_w] \cap \phi \neq \emptyset\}$$

Following Fox (2007), I have then motivated the modification of (2) in (4). However, I have not yet motivated the first step from (2) to (3).

$$(4) \quad \mathcal{Excl}_{inn}(\mathbf{p}, \mathcal{Alt}(\mathbf{p})) = \\ \bigcap \{X : X \subseteq \mathcal{Alt}(\mathbf{p}) : \{\neg \mathbf{q} : \mathbf{q} \in X\} \cup \{\mathbf{p}\} \text{ is MAXIMAL and CONSISTENT}\}$$

In this chapter, I first discuss the motivation for moving from excluding only stronger alternatives to excluding also logically independent ones. I, then, discuss how the inclusion of logically independent alternatives also over- and under-generates. Finally, I propose a solution to each problem and compare it to others given in the literatures (Fox 2007 and Chemla in preparation). The main argument against both of these alternative proposals is going to be that they do not predict the inference from (5a) to (5b). I argue, instead, that (5b) is an inference of (5a) and the theory in this chapter predicts it.

- (5) a. None of these professors killed all of their students.
- b. Each of these professors killed some of his students.

Notice that the notion of exclusion that I adopt is (4), however most of the points in the first part could be made by using the simpler (3). Notice also that although in presenting the problem I make use the grammatical theory of scalar implicatures, these are general problems for all theories of scalar implicatures that allow the exclusion of logically independent alternatives.

6.1 Motivating the exclusion of logically independent alternatives

6.1.1 First argument: non-monotonic contexts

As Spector (2007a) observes, an approach based on (2) predicts that when scalar items are embedded in non-monotonic contexts like (6a), no scalar implicatures should arise.

- (6) a. Exactly one of the students did some of the readings.
- b. Exactly one of the students did all of the readings.

While (6b) is an alternative of (6a), given the standard procedure adopted in CHAPTER 1, it is also logically independent of (6a), therefore it is not among the excludable alternatives according to (2). Spector (2007a), however, provides the intuition that (6a) can be read as in (7). If he is right, then we need a way to obtain the reading in (7).

(7) Exactly one did some but not all of the readings and all of the others did none of them.

As he observes, (7) is precisely what we would obtain if we could exclude the logically independent alternative in (6b). To illustrate, consider (8): the first conjunct requires that one and only one student did some or all of the readings. This entails that all of the others did no reading. The second conjunct requires that either none or more than one student did all of the readings. Together with the first conjunct, we can conclude that the only one that did some of the readings didn't do them all and that all of the others did none of them.

(8) Exactly one of the students did some of the readings $\wedge \neg$ [Exactly one of the students did all of the readings]

In sum, a theory based on (2) does not predict scalar implicatures in non-monotonic contexts. If, instead, we could exclude logically independent alternatives, we would be able to obtain the right inferences. In the next section, I summarize two additional problems for the standard definition of excludable alternatives.

6.1.2 Second argument: existential modals and free choice

6.1.2.1 Existentials

Consider the dialogue in (9): from B's response in (9b), we intuitively draw the inference in (10).¹

(9) *context: looking at a cake and an ice-cream on the table*

- a. A: What can we eat?
- b. B: We can eat the cake.

(10) We can't eat the ice-cream.

¹Thanks to Danny Fox (p.c.) for suggesting this argument to me.

However, it can be shown that we only obtain the inference in (10) from (9b) if we can exclude the logically independent alternative (11a) and not only the stronger one in (11b).

- (11) a. We can eat the ice-cream.
b. We can eat the cake and the ice-cream.

The reason for this is the fact that the conjunction of (9b) and the negation of (11b) does not entail (10). More schematically, (12a) does not entail (12b): if there exists a world in which we eat the cake and no world in which we eat both the cake and the ice-cream, still there could be a world in which we eat the ice-cream alone, contrary to what (10) (= (12b)) says.

- (12) a. $\Diamond[\text{cake}] \wedge \neg\Diamond[\text{cake} \wedge \text{ice-cream}]$
b. $\neg\Diamond[\text{ice-cream}]$

In sum, another argument for logically independent alternatives comes from cases with existential modals like (9b) above. In the next section, I present a related argument, coming from the phenomenon of so-called ‘free choice permission’.²

6.1.2.2 Free choice

The phenomenon of free-choice is exemplified by (13a), which has the interpretation in (13b).³

- (13) a. You may have the cake or the ice-cream.
b. You may have the cake and you may have the ice-cream (and you aren’t allowed to take both)

²Notice that this argument does not apply to Klinedinst’s (2007) treatment of free choice. The argument has force insofar as we have reasons to prefer Fox’s (2007) account of free-choice over Klinedinst’s (2007). I leave this open here.

³The exclusivity inference that you are not allowed to take both the cake and the ice-cream can be absent. Nothing changes for the point here, but for completeness I illustrate the case without the exclusivity inference in detail in Appendix C.

What is remarkable is that in this interpretation a disjunction winds up having a conjunctive meaning. Kratzer and Shimoyama (2002) and Alonso Ovalle (2005) show that these inferences have the characteristics of scalar implicatures and Fox (2007) shows that the grammatical theory of scalar implicatures can derive them as scalar implicatures of sort. The gist of the idea is to apply the EXH operator recursively. I will not go too much in detail here, for our purposes it is enough to show that Fox's theory works only if it is based on a notion of excludable alternatives that is not restricted to stronger alternatives but that includes also logically independent ones. Consider the schematic version of (12a) in (14a) and its alternatives in (14b).

$$(14) \quad \begin{array}{ll} \text{a.} & \Diamond(p \vee q) \\ \text{b.} & \mathcal{Alt}_1(\Diamond(p \vee q)) = \left\{ \begin{array}{l} \Diamond[p \vee q] \\ \Diamond p \\ \Diamond q \\ \Diamond[p \wedge q] \end{array} \right\} \end{array}$$

The result of exhaustifying (14a) is (15).

$$(15) \quad \text{EXH}[\Diamond(p \vee q)] = \Diamond(p \vee q) \wedge \neg\Diamond(p \wedge q)$$

Consider now what happens if we exhaustify again: the alternatives that we have to consider are the exhaustifications of the alternatives in \mathcal{Alt}_1 , represented in (16). Notice in particular the exhaustification of $\Diamond p$ and $\Diamond q$, which is done with respect to the alternatives in \mathcal{Alt}_1 . Crucially, as we are allowing ourselves to exclude logically independent alternatives, in the case of $\Diamond p$ we negate $\Diamond q$ and viceversa.

$$(16) \quad \mathcal{Alt}_2(\text{EXH}[\Diamond(p \vee q)]) = \left\{ \begin{array}{l} \text{EXH}_{\mathcal{Alt}_1}[\Diamond[p \vee q]] = \Diamond(p \vee q) \wedge \neg\Diamond(p \wedge q) \\ \text{EXH}_{\mathcal{Alt}_1}[\Diamond p] = \Diamond p \wedge \neg\Diamond q \\ \text{EXH}_{\mathcal{Alt}_1}[\Diamond q] = \Diamond q \wedge \neg\Diamond p \\ \text{EXH}_{\mathcal{Alt}_1}[\Diamond[p \wedge q]] = \Diamond[p \wedge q] \end{array} \right\}$$

At this point, we now exhaustify again with respect to this second set of alternatives and in this way we obtain the free choice inferences. This is because when we negate the exhaustification of $\Diamond p$ and $\Diamond q$, we obtain a biconditional that, together with the assertion, entails the conjunction of $\Diamond p$ and $\Diamond q$.

$$\begin{aligned}
 (17) \quad & \text{EXH}_{\mathcal{Alt}_2}[\text{EXH}_{\mathcal{Alt}_1}\Diamond[p \vee q]] = \\
 & [\Diamond(p \vee q) \wedge \neg\Diamond(p \wedge q)] \wedge \neg(\Diamond p \wedge \neg\Diamond q) \wedge \neg(\Diamond q \wedge \neg\Diamond p) = \\
 & [\Diamond(p \vee q) \wedge \neg\Diamond(p \wedge q)] \wedge (\Diamond p \rightarrow \Diamond q) \wedge (\Diamond q \rightarrow \Diamond p) = \\
 & [\Diamond(p \vee q) \wedge \neg\Diamond(p \wedge q)] \wedge (\Diamond p \leftrightarrow \Diamond q) = \\
 & [\Diamond(p \vee q) \wedge \neg\Diamond(p \wedge q)] \wedge \Diamond p \wedge \Diamond q
 \end{aligned}$$

What is crucial for us here is that the alternatives in (18a) and (18b), which are the ones that allow us to obtain the free choice inferences in the derivation above, are only obtained if we exclude logically independent alternatives (that is, if we negate $\Diamond q$ when exhaustifying $\Diamond p$ and vice-versa).

$$\begin{aligned}
 (18) \quad & \text{a. } \text{EXH}_{\mathcal{Alt}_1}[\Diamond p] = \Diamond p \wedge \neg\Diamond q \\
 & \text{b. } \text{EXH}_{\mathcal{Alt}_1}[\Diamond q] = \Diamond q \wedge \neg\Diamond p
 \end{aligned}$$

In sum, we saw that we can derive free choice inferences, in the way Fox (2007) proposed, if we use a notion of excludability of alternatives like Excl_{inn} . I show now that we cannot derive them if we exclude only stronger alternatives - that is if we use Excl_{st} . Consider again the exhaustification of $\Diamond p$ and $\Diamond q$ in the first set of alternatives: if only stronger alternatives are excludable, the only alternative that we can exclude is $\Diamond(p \wedge q)$, therefore obtaining (19a) and (19b) (which now replace (18a) and (18b) above).

$$\begin{aligned}
 (19) \quad & \text{a. } \text{EXH}_{\mathcal{Alt}_1}[\Diamond p] = \Diamond p \wedge \neg\Diamond(p \wedge q) \\
 & \text{b. } \text{EXH}_{\mathcal{Alt}_1}[\Diamond q] = \Diamond q \wedge \neg\Diamond(p \wedge q)
 \end{aligned}$$

At this point, at the second round of exhaustification the negations of (19a) and (19b) are incompatible with the exclusivity inference, that is $\neg\Diamond(p \wedge q)$, obtained at the first exhaustification. Therefore, we cannot exclude (19a) and (19b) and, as a consequence, the second exhaustification this time is just vacuous. This, in turn, means that we do not derive free choice inferences.⁴

$$(21) \quad \text{EXH}_{Alt_2}[\text{EXH}_{Alt_1}\Diamond[p \vee q]] = \\ (\Diamond p \vee q) \vee \neg\Diamond(p \wedge q)$$

6.1.3 Summary

Summing up, logically independent alternatives are needed for obtaining scalar implicatures in non-monotonic contexts, in certain sentences containing existential modals and in order to derive free choice inferences. Each of these cases is an argument for moving from the standard notion of excludable alternatives Excl_{st} to one like Excl_{inn} . In other words, they are arguments for modifying the scalar reasoning so as to include also logically independent alternatives. We have now motivated the inclusion of logically independent alternatives, so let us now turn to two problems that they give rise to.

6.2 The Over-generation Problem

6.2.1 The problem

As Fox (2007), Magri (2010a) and Chemla (in preparation) discuss, logically independent alternatives cause an overgeneration problem in sentences with multiple scalar items. Consider (22a): beyond giving rise to the unproblematic scalar implicature that not all of the students did all of the readings, it is also predicted to give rise to the inference in (22c). (22c) is the negation of the logically independent alternative in (22b), obtained by replacing *some* with *all* and *all*

⁴As it is easy to show, (20) is a contradiction: either one or the other but not both but if either of them then both.

$$(20) \quad \Diamond(p \vee q) \wedge \neg\Diamond(p \wedge q) \wedge (\Diamond p \rightarrow \Diamond(p \wedge q)) \wedge (\Diamond q \rightarrow \Diamond(q \wedge p)) = \perp$$

with *some*.

- (22)
- a. Some of the students did all of the readings.
 - b. *Alternative*: All of the students did some of the readings.
 - c. *Scalar implicature*: \neg [All of the students did some of the readings] =
Some of the students did none of the readings.

However, this is intuitively a wrong result, there appears to be no case in which (22a) would suggest anything about students doing none of the readings. A similar case is (23a). In this case the negation of the logically independent alternative in (23b), obtained by replacing *allowed* with *required* and *all* with *some*, gives rise to the inference in (23c). (23c) is again intuitively not attested: if I am saying that we are allowed to take all of the phonology classes in the first year, I am not suggesting at all that we are also allowed to take none of them.

- (23)
- a. We are allowed to take all of the phonology classes in the first year.
 - b. *Alternative*: We are required to take some of the phonology classes in the first year.
 - c. *Scalar implicature*: \neg [We are required to take some of the phonology classes in the first year] = We are allowed to take none of the phonology classes in the first year.

Notice that similar cases like (24a), instead, do not create problems. (24a) is just like (22) but this time it is *all* that embeds *some*. In this particular case, the inference that we obtain by negating the alternative in (24b) is also equivalent to what one would obtain with a local scalar implicature, namely *all of the students did some but not all of the readings* (see Chemla and Spector 2011 and Chierchia et al. To appear for discussion).

- (24)
- a. All of the students did some of the readings.
 - b. *Alternative*: Some of the students did all of the readings.
 - c. *Scalar implicature*: \neg [Some of the students did all of the readings] =

None of the students did all of the readings.

In other cases like (25a), there is no corresponding equivalent local implicature. The inference in (25c) is obtained by negating the alternative in (25b), which is in turn obtained by substituting *no* (=not some) with *not all* and *all* with *some*.⁵

- (26) a. None of the students did all of the readings.
 b. *Alternative*: Not all of the students did some of the readings.
 c. *Scalar implicature*: $\neg[(26b)]$ = All of the students did some of the readings.

I argue that the inference in (26c) is an inference of (26a). An argument for the existence of this inference comes from Hurford's constraint, discussed in CHAPTER 1 (Hurford 1974; see also Singh 2008b). Recall that the constraint regards the fact that a disjunction isn't felicitous if one of the disjuncts entails the other and can help us explaining the infelicity of (27).

- (27) #John is in Italy or in Milan.

In cases in which this constraint appears violated, like in (28a), Chierchia et al. (To appear) argue that there is an embedded exhaustivity operator as in (28b), which makes (28a) equivalent to (28c) and, therefore, disrupts the entailment relation between the disjuncts.

- (28) a. John solved some or all of the problems.
 b. [EXH[John solved some] or all of the problems]
 c. John solved some but not all of the problems or he solved them all.

⁵The alternative *not all* for *no* is motivated by a decompositional analysis of *no* as *not some* and by the scalar implicature in (25c) of a sentence like (25a), which can be obtained if we have and negate the alternative in (25b). In other words, if *not all* has *no* has an alternative (see CHAPTER 3, section 3.6).

- (25) a. Not all of the students came.
 b. None of the students came.
 c. Some of the students came.

On the basis of Hurford's constraint and the idea that sometimes its apparent violations reveals the presence of local scalar implicatures, Chierchia et al. (To appear) construct a case for the existence of the inference in (29b) from (29a).

- (29) a. All of the students did some of the readings.
 b. None of the students did all of the readings.

(29b) can be obtained by a local exhaustification as in (30a), which gives rise to the meaning in (30b), which in turn entails (29b).

- (30) a. All of x [x is a student] [EXH[x did some of the readings]]
 b. All of the students did some but not all of the readings

The logic of the argument is as follows: one creates a disjunction, where one of the disjunct entails the other in all readings of (29a) but the one with the scalar implicature in (29b). The case Chierchia et al. (To appear) construct is (31), which is felicitous and is compatible with Hurford's constraint, only if we interpret (31) as (32).

- (31) Every student solved some of the problems, or Jack solved all of them and all the other students solved only some of them.
- (32) Every student solved some but not all of the problems, or Jack solved all of them and all the other students solved only some of them.

Chierchia et al. (To appear) were constructing this argument as an argument for local exhaustification, that is for the existence of embedded scalar implicatures. Notice, however, that as said above, we actually have two ways to derive the inference in (29b): the local derivation just presented and a global derivation, which excludes the logically independent alternative in (33) (see Chemla and Spector 2011).

- (33) Some of the students did all of the readings.

In this case, then, proving the existence of the inference in (29b) cannot distinguish between the two derivations. In other words, it is an argument for either the need of local scalar implicatures or logically independent alternatives, but it does not distinguish between the two.

In other cases, however, we can distinguish between embedded scalar implicatures and global scalar implicatures obtained via the exclusion of logically independent alternatives. Consider in particular what happens if we apply the same logic of Chierchia et al.'s (To appear) argument to the case in (34a), repeated from above: we construct a disjunction that is felicitous under Hurford's constraint only if we assume that the first disjunct has the scalar implicature that I am proposing in (34b).

- (34) a. None of the students did all of the readings.
 b. All of the students did some of the reading.

Given that there is no local derivation of the inference in (34b), the argument, if successful, is going to be an argument for logically independent alternatives. In sum, to check whether a sentence like (34a) can have the inference in (34b), we construct the disjunction in (35), which is such that the second disjunct entails the first one unless the latter has the implicature in (34b).

- (35) None of my professors failed all of their students or Gennaro failed none and all of the others failed just some

To my ears, while a little involved as a sentence, (35) is felicitous, thereby supporting the existence of the inference in (34b), which can only be derived via the alternative in (36).

- (36) Not all of the students did some of the readings.

Summing up, some sentences with a scalar item embedded into another creates an over-generation problem. The question to answer at this point is what distinguishes the problematic and the non-problematic cases above. I turn to this task now.

6.2.2 The generalization

Following Magri (2010a), I argue that the generalization should be formulated in terms of the strength of the scalar items involved; in other words, whether a scalar item is strong or weak in the environment in which it is in and with respect to its alternatives. For instance, according to this notion of strength, *every* is strong as it appears in (37a), because (37a) is stronger than its alternatives with *some* in (38a). However, *every* is weak when it appears in a downward entailing environment like in (37b), because (37b) is weaker than its alternative (38b).

- (37) a. **Every** student came
 b. I doubt that **every** student came
- (38) a. **Some** student came
 b. I doubt that **some** student came

In a configuration of two scalar items, one embedded into the other, there are, therefore, four logical possibilities (where $\alpha[\beta]$ indicates that α embeds β).

- (39) a. STRONG[STRONG]
 b. WEAK[WEAK]
 c. STRONG[WEAK]
 d. WEAK[STRONG]

Let us go through each of them in turn. Consider the first configuration, STRONG[STRONG], which is exemplified by (40), with its alternatives in (41).

- (40) All of the students did all of the readings

$$(41) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \mathbf{all[all]} \\ \mathbf{all[some]} \\ \mathbf{some[all]} \\ \mathbf{some[some]} \end{array} \right\}$$

It is easy to see that the alternatives in (41) are all entailed by the assertion, therefore none of them is excludable and no scalar implicature is predicted to arise.

The second configuration, WEAK[WEAK], is exemplified by (42). This time all alternatives in (43) entail the assertion, hence they are all excludable and we end up with the inferences that not all of the students did all of the readings, none of the students did all of the readings and that some of the students didn't do any of the readings. This also appears intuitively correct.

(42) Some of the students did some of the readings

$$(43) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \text{some[some]} \\ \text{all[some]} \\ \text{some[all]} \\ \text{all[all]} \end{array} \right\}$$

The results for these first two configurations are not problematic and are in fact identical for a theory based on stronger alternatives and one based on non-weaker ones. As I show now, the predictions of the two theories diverge in the other two cases. Furthermore, only one of the two cases leads to problematic predictions for the theory based on non-weaker alternatives. Consider the STRONG[WEAK] configuration, which is exemplified by the two non-problematic cases we discussed above in (24a) and (26a). (24a) is represented schematically in (44) with its alternatives in (44b).

(44) **all[some]**

$$(45) \quad \mathcal{Alt}(44) = \left\{ \begin{array}{l} \text{all[some]} \\ \text{all[all]} \\ \text{some[some]} \\ \text{some[all]} \end{array} \right\}$$

The set of excludable alternatives is (46) and the exhaustification of (44) with respect to such set is given in (47). As discussed above, there are cases in which such inference appears to be attested.

$$(46) \quad \text{Excl}_{\text{inn}}(44) = \left\{ \begin{array}{c} \text{some}[\text{all}] \\ \text{all}[\text{all}] \end{array} \right\}$$

$$(47) \quad \llbracket \text{EXH} \rrbracket(\text{all}(\text{some})) = \text{all}[\text{some}] \wedge \neg \text{all}[\text{all}] \wedge \neg \text{some}[\text{all}] =$$

All of the students did some of the readings and none of them did all

Analogously, as argued above, the case in (26a), represented in (48), has the reading in (50), obtained by excluding the alternatives in (51).

$$(48) \quad \text{none}[\text{all}]$$

$$(49) \quad \text{Alt} = \left\{ \begin{array}{c} \text{none}[\text{all}] \\ \text{none}[\text{some}] \\ \text{not all}[\text{all}] \\ \text{not all}[\text{some}] \end{array} \right\}$$

$$(50) \quad \llbracket \text{EXH} \rrbracket(\text{none}[\text{all}]) = \text{none}[\text{all}] \wedge \neg \text{none}[\text{some}] \wedge \neg \text{not all}[\text{some}] =$$

None of the students did all of the readings and all of them did some

$$(51) \quad \text{Excl}_{\text{inn}} = \left\{ \begin{array}{c} \text{none}[\text{some}] \\ \text{not all}[\text{some}] \end{array} \right\}$$

The configuration STRONG[WEAK] is, therefore, not problematic: it gives rise to inferences that appear attested (and sometimes equivalent to local scalar implicatures).

It is the fourth option, the one in which a weak-scalar item embeds a strong one, that gives rise to the over-generation problem. Consider the case in (52), repeated from above, with its alternatives in (53).

$$(52) \quad \text{Some of the students did all of the readings}$$

$$(53) \quad \mathcal{Alt} = \left\{ \begin{array}{l} \mathbf{some[all]} \\ \mathbf{all[all]} \\ \mathbf{some[some]} \\ \mathbf{all[some]} \end{array} \right\}$$

The inference that we obtain by excluding the alternatives in (54) is in (55). As said above, this is problematic because, intuitively, there appears to be no case in which (52) has the reading in (55).

$$(54) \quad \mathcal{Excl}_{inn} = \left\{ \begin{array}{l} \mathbf{all[some]} \\ \mathbf{all[all]} \end{array} \right\}$$

$$(55) \quad \llbracket \text{EXH} \rrbracket (\mathbf{some[all]}) = \mathbf{some[all]} \wedge \neg \mathbf{all[all]} \wedge \neg \mathbf{all[some]} =$$

Some of the students did all of the readings and some of them didn't do any

In the next section, I propose a solution to the overgeneration problem. Before that, let me observe that it is not clear how a solution in terms of a notion of relevance like that presented in CHAPTER 1 could be given. In particular, it is not clear how relevance could block the logically-independent alternative in a WEAK[STRONG] configuration but not the alternative of a STRONG[WEAK] one.

6.3 The Solution

I propose a new algorithm for computing which alternatives are excludable in a given sentence. The proposal is based on two ingredients: the notion of excludable alternatives, \mathcal{Excl}_{inn} , and a recursive procedure for considering which alternatives are excludable. The gist of the idea is that the excludability of alternatives should not be evaluated by looking at all of the alternatives together, but one should rather proceed in steps starting from the most embedded scalar item.⁶

⁶Notice that instead of talking about “the most embedded scalar item”, we could define the procedure as applying at each scope site as it proceeds bottom up. This is possible as long as we ensure that we only have one scalar item for scope site. This move would make the proposal here compatible with a theory of alternatives like Fox and Katzir

6.3.1 The procedure

Let us start by defining two auxiliary notions, a standard notion of c-command as in (56) and the notion of most embedded scalar item (to be refined below).

- (56) **C-command:** A C-commands B iff A doesn't dominate B and the first relevant branching node that dominates A dominates B.
- (57) **Most-embedded scalar item (first version)** A scalar item embeds another if it c-commands it. A scalar item X is the most embedded scalar item in a sentence ϕ iff for all scalar item Y in ϕ , Y c-commands X.

The steps of the procedures are summarized in (58), for some sentence S (or more precisely its LF) with n scalar items.

- (58) **Step 1:** Construct all possible alternatives of S that you can obtain by only replacing its most embedded scalar item, call this set \mathcal{Alt}_1
- Step 2:** Compute the excludable subset of \mathcal{Alt}_1 . Call it \mathcal{Excl}_1 .
- Step 3:** Now consider the set of alternatives \mathcal{Alt}_1' , which is $\{ \llbracket S \rrbracket \} \cup \mathcal{Excl}_1$
- Step 4:** Starting from \mathcal{Alt}_1' , collect all possible alternatives by only replacing the *next* most embedded scalar item and obtain \mathcal{Alt}_2 .⁷
- Step 5:** Compute the excludable subset of \mathcal{Alt}_2 . Call it \mathcal{Excl}_2 .
- ... Repeat until you exhaust all scalar items in S.*
- Final Step:** the set of excludable alternatives is the last excludable set obtained with the steps above, \mathcal{Excl}_n .

In the next section, I illustrate how this procedure provides a solution to the over-generation problem.

(2011), where there is no notion of “scalar item”.

⁷The next most embedded scalar of Y in some sentence ϕ is simply the most embedded scalar item in ϕ if we ignore Y.

6.3.2 Application

6.3.2.1 Blocking Weak Strong

Let us go back the case in (59a) with the LF in (59b) and apply the procedure.

- (59) a. Some of the students did all of the readings
 b. [Some₁ [all₂ [t₁ did t₂]]]

Step 1: we compute all the possible alternatives by replacing the most embedded scalar item with all its scale mates, thereby obtaining the set of alternatives in (60).

$$(60) \quad \mathcal{Alt}_1(59a) = \left\{ \begin{array}{l} \mathbf{some}(\mathbf{all}) \\ \mathbf{some}(\mathbf{some}) \end{array} \right\}$$

Second Step: we then consider the set of excludable alternatives of (60) with respect to (59a). In this case the set is just empty.

$$(61) \quad \mathcal{Excl}_1(59a) = \left\{ \emptyset \right\}$$

Third Step: we now go back to the set of alternatives corresponding to the assertion and the excludable alternatives in \mathcal{Excl}_1 . Given that the latter is empty, the set that we obtain is simply (62).

$$(62) \quad \mathcal{Alt}_1'(59a) = \left\{ \mathbf{some}(\mathbf{all}) \right\}$$

Step 4: at this point are ready to compute the alternatives by replacing the next most embedded scalar item and we obtain \mathcal{Alt}_2 .

$$(63) \quad \mathcal{Alt}_2(59a) = \left\{ \begin{array}{l} \mathbf{some}(\mathbf{all}) \\ \mathbf{all}(\mathbf{all}) \end{array} \right\}$$

Step 5: finally, we compute the set of excludable alternatives of (63) with respect to the sentence in (59a) above.

$$(64) \quad \mathcal{E}_{xcl_2}(59a) = \left\{ \mathbf{all[all]} \right\}$$

Final Step: the set of excludable alternatives is the last one obtained, that is \mathcal{E}_{xcl_2} .

$$(65) \quad \mathcal{E}_{xcl}(59a) = \mathcal{E}_{xcl_2} = \left\{ \mathbf{all[all]} \right\}$$

Given the set of excludable alternatives in (65), when we exhaustify we only get the attested inference that not all of the students did all of the readings and crucially we do not get the problematic one that some of the students didn't do any of the readings.

$$(66) \quad \llbracket \text{EXH} \rrbracket (\mathbf{some[all]}) = \text{Some of the students did all of the readings and not all of the students did all of them}$$

In sum, we saw that the proposed procedure for computing excludable alternatives does not run into the over-generation problem. Let us now go through how it allows, instead, the exclusion of the logically independent alternative of a STRONG[WEAK] configuration.

6.3.2.2 Not blocking Strong Weak

Consider again the case in (67a) with the LF in (67b).

- (67) a. None of the students did all of the readings
b. $[\text{None}_1 [\text{all}_2 [\text{t}_1 \text{ did } \text{t}_2]]]$

Step 1: we compute all the possible alternatives by replacing the most embedded scalar item with all its scale mates, thereby obtaining the set of alternatives in (68).

$$(68) \quad \mathcal{Alt}_1(67a) = \left\{ \begin{array}{l} \mathbf{none(all)} \\ \mathbf{none(some)} \end{array} \right\}$$

Second Step: we then consider the set of excludable alternatives of (68) with respect to (67a), which is (69) in this case.

$$(69) \quad \mathcal{Excl}_1(67a) = \left\{ \mathbf{none(some)} \right\}$$

Step 3: at this point, we consider \mathcal{Alt}_1' , that is the assertion plus the excludable alternatives in (69).

$$(70) \quad \mathcal{Alt}_1'(67a) = \left\{ \begin{array}{l} \mathbf{none(all)} \\ \mathbf{none(some)} \end{array} \right\}$$

Step 4: we are ready to compute the alternatives by replacing the next most embedded scalar item and we obtain \mathcal{Alt}_2

$$(71) \quad \mathcal{Alt}_2(67a) = \left\{ \begin{array}{l} \mathbf{none(all)} \\ \mathbf{none(some)} \\ \mathbf{not all(all)} \\ \mathbf{not all(some)} \end{array} \right\}$$

Step 5: finally, we compute the set of excludable alternatives of (71) with respect to the sentence in (67a) above.

$$(72) \quad \mathcal{Excl}_2(67a) = \left\{ \begin{array}{l} \mathbf{none(some)} \\ \mathbf{not all(some)} \end{array} \right\}$$

Final Step: the set of excludable alternatives is the last one obtained, that is \mathcal{Excl}_2 .

$$(73) \quad \mathcal{Excl}(67a) = \left\{ \begin{array}{l} \mathbf{none(some)} \\ \mathbf{not all(some)} \end{array} \right\}$$

Notice that crucially we have **not all(some)** among the alternatives, therefore we obtain the reading discussed above: none of the students did all of the readings but all of students did some of them.

- (74) $\llbracket \text{EXH} \rrbracket(\text{none}[\text{all}]) = \text{None of the students did all of the readings but all of them did some of the readings}$

6.3.3 Summing up

Scalar items in non-monotonic contexts and existential modals require including logically independent alternatives in scalar reasoning. However, these alternatives create cases of over-generation. The recursive algorithm for computing excludable alternatives proposed here takes care of the problem, while also accounting for the inference in (26c). I turn now to a further problem caused by logically independent alternatives.

6.4 The Under-generation Problem

A disjunction embedded under a universal quantifier like (75a) gives rise to the inferences in (75b) and (75c). These inferences are called ‘free-choice’ or ‘distributive’ inferences (see Sauerland (2004), Fox (2007), and Chemla (in preparation) among others).

- (75) a. Everyone took syntax or semantics
 b. Someone took syntax
 c. Someone took semantics

These inferences arise in all configurations where a universal quantifier over individuals or worlds embeds a disjunction or symmetrically a negated existential quantifier embeds a conjunction as in (76).

- (76) No student took both semantics and syntax

- a. Some student took semantics
- b. Some student took syntax

To see how the inferences are derived consider a schematic version of (75a) in (77a) and its alternatives in (77b).

(77) a. **every(syntax or semantics)**

$$b. \text{Alt}(77a) = \left\{ \begin{array}{l} \mathbf{every(syntax\ or\ semantics)} \\ \mathbf{every(syntax)} \\ \mathbf{every(semantics)} \\ \mathbf{every(syntax\ and\ semantics)} \end{array} \right\}$$

The excludable alternatives are those in (78), therefore negating them all we get the inferences in (79).

$$(78) \quad \mathcal{E}xcl_{ie}(77a) = \left\{ \begin{array}{l} \mathbf{every(syntax)} \\ \mathbf{every(semantics)} \\ \mathbf{every(syntax\ and\ semantics)} \end{array} \right\}$$

(79) $\llbracket EXH \rrbracket(\mathbf{every(syntax\ or\ semantics)}) =$

$$\mathbf{every(syntax\ or\ semantics)} \wedge \neg \mathbf{every(syntax\ and\ semantics)} \wedge \\ \neg \mathbf{every(syntax)} \wedge \neg \mathbf{every(semantics)} =$$

Every student took syntax or semantics and not every student took both and some of them took syntax and some of them took semantics

The problem is that the alternatives of the single disjuncts, **every(syntax)** and **every(semantics)**, are not innocently excludable once we also consider further alternatives, that is **some(syntax)** and **some(semantics)**. These two alternatives are obtained from replacing both the high quantifier *every* and the disjunction for one of the disjuncts and, in fact, there is no reason for why we should not also consider them in the set of alternatives. The set that we should actually consider

is, therefore, not the one in (77b) but that in (80).

$$(80) \quad \mathcal{Alt}(77a) = \left\{ \begin{array}{l} \text{every}(\text{syntax or semantics}) \\ \text{every}(\text{syntax}) \\ \text{every}(\text{semantics}) \\ \text{every}(\text{syntax and semantics}) \\ \text{some}(\text{syntax or semantics}) \\ \text{some}(\text{syntax}) \\ \text{some}(\text{semantics}) \\ \text{some}(\text{syntax and semantics}) \end{array} \right\}$$

It is easy to see that the two alternatives become non-innocently excludable because their exclusion entails the inclusion of the other two. As we saw above, the exclusion of **every(syntax)** and **every(semantics)**, together with the assertion, entails that **some(syntax)** and **some(semantics)**. This means that the excludable alternatives are now only those in (81) and from (81) we cannot conclude that some of the students took syntax and some of the students took semantics.

$$(81) \quad \mathcal{Excl}_{ie}(77a) = \left\{ \begin{array}{l} \text{every}(\text{syntax and semantics}) \\ \text{some}(\text{syntax and semantics}) \end{array} \right\}$$

$$(82) \quad \llbracket \text{EXH} \rrbracket (\text{every}(\text{syntax or semantics})) = \text{every}(\text{syntax or semantics}) \wedge \neg \text{every}(\text{syntax and semantics}) \wedge \neg \text{some}(\text{syntax and semantics}) =$$

Every student did syntax or semantics and nobody did both

Notice that by excluding the alternative **some(syntax and semantics)** we conclude that nobody did both syntax and semantics instead of just that not everyone did both. This appears to be a reading of the sentence in (75a) (see also Klinedinst (2007) for discussion). The problem of under-generation is orthogonal to this; the problem is that we do not predict anymore the two distributive inferences that we used to derive with the smaller set of alternatives above in (77b).

6.5 A first strategy and its problem

A first strategy to solve the under-generation problem is modifying the algorithm proposed above, in order to block also the cases of under-generation. There is, in fact, a simple way to do this, just modifying the final step of the procedure above so that instead of taking the last obtained excludable set it takes the union all the excludable sets obtained at each step of the procedure.

- (83) **Final Step:** the set of excludable alternatives \mathcal{E}_{xcl} is the last excludable set obtained from the algorithm, that is \mathcal{E}_{xcl}_n .
- (84) **Final Step (revised):** the set of excludable alternatives \mathcal{E}_{xcl} is the union of all excludable sets $\mathcal{E}_{xcl}_1.. \mathcal{E}_{xcl}_n$.

This move does not change anything for the over-generation problem, because, as one can easily check, in the two relevant cases, it is always the case that the union of all excludable sets is equivalent to the last excludable set obtained in the procedure. Therefore, if successful in accounting for the under-generation problem, the revised algorithm would constitute a unified solution for both the over- and the under-generation problem. In the next section, I illustrate how this procedure provides a solution to the under-generation problem and I discuss an open problem that it has.

6.5.1 Back to the under-generation problem

Consider again the case in (85a), with the LF in (85b) and let me describe the steps of the procedure as applied to the case here.

- (85) a. Every student took syntax or semantics
b. [Every student₁ [t₁ [took [syntax or semantics]]]]

Step 1 is constructing all alternatives by replacing only the most embedded scalar item, which is disjunction in this case, thus obtaining the alternatives in (86).

$$(86) \quad \mathcal{Alt}_1(85a) = \left\{ \begin{array}{l} \mathbf{every(syntax \ or \ semantics)} \\ \mathbf{every(syntax)} \\ \mathbf{every(semantics)} \\ \mathbf{every(syntax \ and \ semantics)} \end{array} \right\}$$

Step 2 is looking at this set of alternatives and compute the excludable subset thereof. The results is in (87). As we will see below, the effect of the modified procedure is going to be that these alternatives now stay for good in the set of excludable ones.

$$(87) \quad \mathcal{Excl}_1(85a) = \left\{ \begin{array}{l} \mathbf{every(syntax)} \\ \mathbf{every(semantics)} \\ \mathbf{every(syntax \ and \ semantics)} \end{array} \right\}$$

In **Step 3**, we consider the set of alternatives \mathcal{Alt}_1' , which is the alternatives corresponding to the asserted sentence plus all members of \mathcal{Excl} . In the case at hand, \mathcal{Alt}_1' happens to be just the same as \mathcal{Alt}_1 .

$$(88) \quad \mathcal{Alt}_1'(85a) = \left\{ \begin{array}{l} \mathbf{every(syntax \ or \ semantics)} \\ \mathbf{every(syntax)} \\ \mathbf{every(semantics)} \\ \mathbf{every(syntax \ and \ semantics)} \end{array} \right\}$$

We are now at **Step 4** of the procedure; this is analogous to **Step 1**: we compute the alternatives by replacing only the next most embedded scalar item, thereby obtaining \mathcal{Alt}_2 .

$$(89) \quad \mathcal{Alt}_2(85a) = \left\{ \begin{array}{l} \text{every}(\text{syntax or semantics}) \\ \text{every}(\text{syntax}) \\ \text{every}(\text{semantics}) \\ \text{every}(\text{syntax and semantics}) \\ \text{some}(\text{syntax or semantics}) \\ \text{some}(\text{syntax}) \\ \text{some}(\text{semantics}) \\ \text{some}(\text{syntax and semantics}) \end{array} \right\}$$

In **Step 5**, we collect the set of all excludables alternatives, that is \mathcal{Excl}_2 .

$$(90) \quad \mathcal{Excl}_2(85a) = \left\{ \begin{array}{l} \text{every}(\text{syntax and semantics}) \\ \text{some}(\text{syntax and semantics}) \end{array} \right\}$$

Finally, in the **Step six**, we compute the union of \mathcal{Excl}_1 and \mathcal{Excl}_2 and obtain the final set of excludable alternatives in (91).

$$(91) \quad \mathcal{Excl}(85a) = \left\{ \begin{array}{l} \text{every}(\text{syntax}) \\ \text{every}(\text{semantics}) \\ \text{every}(\text{syntax and semantics}) \\ \text{some}(\text{syntax and semantics}) \end{array} \right\}$$

As one can see, we only obtain the alternatives that allow us to derive the right distributive inferences that we wanted.

$$(92) \quad \llbracket \text{EXH} \rrbracket (\text{every student}(\text{syntax or semantics})) =$$

Every student took syntax or semantics and some student took syntax and some student took semantics and nobody took both

In the final step, we take the union of \mathcal{Excl}_1 and \mathcal{Excl}_2 and crucially we have all the alternatives that we need in order to get the distributive inferences. In the next section, I outline a problem

for this modified algorithm.

6.5.2 The problem

The new procedure runs into a problem in a case of multiple disjunctions like (93), as it predicts the unattested inference in (93b).

- (93) a. Jon, Paul or Sue will come.
b. Sue won't come.

To illustrate, consider a possible parsing for (93a) in (94).

(94) $(p \vee q) \vee r$

In the first excludable set we have the alternative $(p \wedge q) \vee r$ and this winds up being an excludable alternative also in the final stage, given that the new algorithm takes the union of all excludable subsets. The problem is that the negation of this alternative is problematic, as it gives rise to the negation of r . I show this in (95a)-(95f).

(95) a. $(p \vee q) \vee r$
b. $\mathcal{Alt}_1 = \left\{ \begin{array}{l} (p \vee q) \vee r \\ p \vee r \\ q \vee r \\ (p \wedge q) \vee r \end{array} \right\}$
c. $\mathcal{Excl}_1 = \left\{ (p \wedge q) \vee r \right\}$
d. $\mathcal{Alt}_{1'} = \left\{ \begin{array}{l} (p \vee q) \vee r \\ (p \wedge q) \vee r \end{array} \right\}$

$$\begin{aligned}
\text{e. } \mathcal{Alt}_2 &= \left\{ \begin{array}{l} (p \vee q) \vee r \\ (p \vee q) \\ r \\ (p \wedge q) \\ (p \wedge q) \vee r \\ (p \vee q) \wedge r \\ (p \wedge q) \wedge r \end{array} \right\} \\
\text{f. } \mathcal{Excl}_2 &= \left\{ \begin{array}{l} (p \wedge q) \\ (p \vee q) \wedge r \\ (p \wedge q) \wedge r \end{array} \right\} \\
\text{g. } \mathcal{Excl} &= \left\{ \begin{array}{l} (p \wedge q) \\ (p \vee q) \wedge r \\ (p \wedge q) \vee r \\ (p \wedge q) \wedge r \end{array} \right\}
\end{aligned}$$

In sum, the modified procedure above would be a unified solution for both the over- and the under-generation problem but makes the wrong predictions in the case of multiple disjunctions. In the next section, I turn to a second strategy for solving the under-generation problem.

6.6 A second strategy

As discussed in CHAPTER 1, focus can affect the possible implicatures that an utterance gives rise to (Rooth 1992 and Fox and Katzir 2011 among others). One of the example discussed above is the contrast between (96b) and (97b): the former, but not the latter, has the inference that John didn't talk to both Mary and Sue.

- (96) a. What did John do yesterday?
b. He [talked to Mary or Sue]_F
- (97) a. Who talked to Mary or Sue yesterday?

- b. [John]_F talked to Mary or Sue yesterday.

The generalization appears to be that in (98) from Zondervan 2009.

- (98) **The QUD Focus Condition for Scalar Implicatures:** A scalar implicature will arise in a sentence iff the scalar term (with which the scalar implicature is associated) is in a constituent that answers the QUD of the context that the sentence is part of, and therefore has focus.

In CHAPTER 1, I showed that (98) can be derived by a notion of relevance based on the partition of the question under discussion. For the purposes of this chapter, it is not important how (98) is derived. We can simply assume that scalar terms can only be replaced if they are within a focused constituent. The question is whether (98) is enough to account for the under-generation problem.

6.6.1 The focus constraint as a solution to the under-generation problem

Notice that given the focus constraint, in order to obtain the problematic alternatives we need to replace both scalar items. Therefore, if the focused constituent does not include both of them, there are no problematic alternatives to begin with.⁸ In a case like (99a), only the disjunction is in focus, therefore we cannot construct alternatives by replacing *each*. This, in turn, means that we will not run into an under-generation problem.

- (99) a. What did each of your students take?
 b. Each of them took [syntax or semantics]_F

In particular, we can only construct alternatives by replacing the scalar item in the focus constituent, that is disjunction, therefore the alternatives that we obtain are only those in (100).

⁸Thanks to Danny Fox (p.c.) for suggesting this strategy as a solution to a problem set in MIT's Pragmatics class, Fall 2009.

$$(100) \quad \text{Alt}(100b) = \left\{ \begin{array}{l} \text{every}(\text{syntax or semantics}) \\ \text{every}(\text{syntax}) \\ \text{every}(\text{semantics}) \\ \text{every}(\text{syntax and semantics}) \end{array} \right\}$$

As we saw above, the exhaustification of (99b) with respect to the alternatives in (100) does give rise to the distributive inferences.

Another possible case is the one in which the disjunction is not in focus like in (101b). In this case the only alternatives that we can construct are the ones in (102), which are all entailed by the assertion, thus no inference is predicted to arise.

- (101) a. Who took syntax or semantics?
 b. [Each of my students]_F took syntax or semantics.

$$(102) \quad \text{Alt}(102b) = \left\{ \begin{array}{l} \text{each}(\text{syntax or semantics}) \\ \text{some}(\text{syntax or semantics}) \end{array} \right\}$$

The question at this point is whether it is possible to have a case with wide focus (including both scalar items) but which gives rise nonetheless to distributive inferences. The question-answer in (103a)-(103b) appears to be a good candidate.

- (103) a. You look happy!, what's up?
 b. [Each of my students took syntax or semantics]_F

Given that the focus includes both scalar items, the alternatives will include both (104a) and (104b). This, in turn, means that we should not have the distributive inferences that some of my students took syntax and some of my students took semantics. Intuitively, however, we still want these inferences.

- (104) a. Some of my students took syntax
 b. Some of my students took semantics

A possible response from the strategy pursued here is arguing that in those cases in which we have focus including both scalar terms and we still perceive distributive inferences, we are actually accommodating a more specific question under discussion than that in (103a). This would be allowed by the fact that the intonational pattern corresponding to wide focus is identical to the ones of other narrower focus, like for instance that in (105).

(105) Every student [took syntax or semantics]_F

In sum, relying on the QUD/focus constraint can account for the under-generation problem, but it forces us to assume that in the case of very general questions under discussion that corresponds to wide focus of the answer and we do perceive the distributive inferences, an accommodation of a more specific question under discussion corresponding to a narrower focus not including both scalar terms must be going on.⁹

⁹Notice that the focus constraint provides a way to modulate other possible inferences coming from multiple scalar terms, which appear not to be always present. Recall that from a sentence like (106a) we can derive the inference in (106b) but also the stronger (106c).

- (106) a. Everybody took syntax or semantics.
 b. Not everybody took syntax and semantics.
 c. Nobody took syntax and semantics.

(106b) is obtained as the negation of the alternative in (107).

(107) Somebody took syntax or semantics.

The focus constraint provides a way to modulate these two inferences: only if *every* is in focus we obtain the alternative in (108a), which negated gives rise to the strong inference in (106c). If the focus, instead, does not include *every* like in (109), we cannot replace it, thus we only expect the weaker inference in (106b) coming from the alternative in (108b).

- (108) a. Somebody took syntax and semantics
 b. Everybody took syntax and semantics

(109) Every student [took syntax or semantics]_F

6.7 Comparison with other accounts

In the following, I summarize briefly Fox's (2007) and Chemla's (in preparation) solutions to the under- and over-generation problems and compare them to the present proposal. As mentioned above, the main argument against both of these alternative proposals is going to be that they do not predict the inference from (110a) to (110b).

- (110) a. None of these professors killed all of their students.
 b. Each of these professors killed some of his students.

6.7.1 Fox 2007

Fox (2007:fn.35) suggests a new definition of alternatives by which the offending alternatives are filtered and do not appear in the set of alternatives from the start. The intuition is the following: each scalar alternative ψ of φ is obtained from φ by a sequence of steps; at each step, only one scalar item can be replaced; and a replacement is licit unless it leads to something weaker.

- (111) The set $\mathcal{Alt}(\varphi)$ is recursively defined as follows:
- a. $\varphi \in \mathcal{Alt}(\varphi)$;
- b. $\psi_1 \in \mathcal{Alt}(\varphi)$ iff there is $\psi_2 \in \mathcal{Alt}(\varphi)$ such that ψ_1 is not weaker than ψ_2 and furthermore ψ_2 is obtained from ψ_1 by replacing a single scalar item in ψ_1 with a Horn-mate.

6.7.1.1 Predictions

It is easy to see that this procedure cannot construct the problematic logically independent alternative in (113) for a WEAK[STRONG] configuration like (112).

- (112) Some of the students did all of the readings.
- (113) All of the students did some of the readings.

This is because there is no way to replace one scalar item at a time in (112) and construct (113), without also going from stronger to weaker alternatives. To illustrate, consider the options that we have in constructing alternatives from (112): first, we cannot replace *all* in (112), because we would obtain the weaker alternative (114).

(114) Some of the students did some of the readings.

The only other option is replacing *some* in (112). In this way, we obtain the alternative in (115), which is stronger than (112), therefore it is a licit alternative. (115), however, is also stronger than (113), therefore, we know we cannot obtain (113) from (115) (by replacing the most embedded *all*).

(115) All of the students did all of the readings.

Analogously, it is easy to see that in the same way the procedure does not allow us to construct the unproblematic alternative in (117) for a STRONG[WEAK] configuration like (116).

(116) All of the students did some of the readings.

(117) Some of the students did all of the readings.

This is because, we cannot replace *some* in (116) or we would obtain the weaker alternative in (118).

(118) Some of the students did some of the readings.

The only option is replacing *some* with *all*. This gives rise to the alternative in (119), which, however, is stronger than (117), so we know that from (119) we cannot construct (117).

(119) All of the students did all of the readings.

Finally, the procedure also blocks the alternatives that create the under-generation problem: consider the case in (120) repeated from above.

(120) Every student took syntax or semantics

Remember that the problematic alternatives were the ones in (121a) and (121b). Consider (121a): we need to make two replacements to obtain it, replacing disjunction with one of its disjuncts and replacing *every* with *some*. It is easy to see that no matter where we start from, we cannot get it with Fox's procedure.

- (121) a. Some student took syntax
b. Some student took semantics

This is because if we start by replacing *every* with *some* we obtain (122a), which is weaker than (120). If we start by replacing disjunction with one of its disjunct we obtain (122b), which is stronger than (120). However, if we now replace *every* in (122b) with *some* we obtain (122c), which is weaker than (122b), thus we cannot include it in the set of alternatives. The same applies to the other disjunct.

- (122) a. Some student took syntax or semantics
b. Every student took syntax
c. Some student took syntax

Summing up, the procedure by Fox (2007) solves the over- and under-generation problem. It blocks, however, also the non-problematic inference of the STRONG[WEAK] configuration. I turn to this now and show that this is a problem for his proposal.

6.7.1.2 Problems

I can see two arguments against Fox's procedure: the first argument is that Fox's constraint does not allow the inference in (123c) from (123a). This is because it cannot construct the alternative

in (123b).

- (123)
- a. None of my ten students solved all of the problems.
 - b. Not all of my ten students solved some.
 - c. All of my ten students solved some.

However, (123c) appears to be an inference of (123a). In particular, I constructed the disjunction in (124) which is predicted to be felicitous only if we allow the inference in (123b) for the first disjunct.

- (124) None of my professors failed all of their students or Gennaro failed none and all of the others failed just some

The fact that (124) is felicitous is therefore an argument against Fox's (2007) procedure, which predicts that (123c) should never be an inference of (123a) and, in turn, it does not predict (124) to be felicitous.

The second argument comes from an observation by Chemla (in preparation). He argues that (125c) is an inference of (125a).

- (125)
- a. All of the students solved some of the problems.
 - b. Many of the students solved all of the problems.
 - c. Not many of the students solved all of the problems.

The judgment is a subtle one, but if he is right, then (125c) is only obtainable by excluding the alternative in (125b). Crucially, the alternative (125b) is *not* allowed by Fox's original constraint. This is because to obtain (125b) we should replace first *some* with *all*, thereby obtaining (126), which is not weaker than (125b). However, (126) is stronger than (125b), so we know we cannot obtain construct the latter from the former.

- (126) All of the students solved all of the problems

Summing up, I have presented two problems for the procedure by Fox (2007). In both cases the problem comes from the fact that the procedure blocks the logically independent alternative of a STRONG[WEAK] configuration, whereas there appear to be inferences coming precisely from that type of alternatives. In the next section, I turn to the proposal in Chemla in preparation.

6.7.2 Chemla 2010

Chemla (in preparation) proposes a unified alternative based approach to presuppositions, free choice inferences and scalar implicatures. I discussed and summarized his proposal in CHAPTER 4, Appendix A, and pointed out to three arguments for the theory proposed in CHAPTERS 3 and 4. In this section, I want to concentrate on the predictions that his system makes with respect to the over- and under-generation problem.

6.7.2.1 Predictions

Before going to the predictions in the case of over- and under-generation, let us go through how multiple scalar items are handled in Chemla's (in preparation) system. Recall that he assumes a set of three procedures for constructing alternatives: (a) "stronger replacements", which substitute each scalar term with a stronger scale-mate, (b) "weaker replacements", which do the same but with weaker scale-mates and (c) "connective split", which for any sentence $p \otimes q$, where \otimes is any connective, it substitutes $p \otimes q$ with p and $p \otimes q$ with q .

In the case of multiple scalar items, the question that arises is how do we go on in constructing alternatives after we do the first replacements on one of the scalar items. Chemla (in preparation) proposes two constraints. The first constraint requires that when we apply a second replacement on the alternatives that we obtained through a first replacement, we should do it in such a way that the same exact transformation is applied to each alternative in each subset of similar alternatives. The second constraint that he proposes is analogous to the one proposed in this chapter and it is the idea is that the second replacement should not apply at a more embedded level than the first one.

To see how these constraints work, let us work through the case of a strong scalar item

embedding a weak one like (127a). Recall that this configuration is not problematic and the procedure proposed in this chapter allows for the inference in (127b), obtained from the exclusion of the logically independent alternative *someone did all of the readings*.

- (127) a. Everyone did some of the readings.
 b. No one did all of the readings.

Chemla (in preparation) also obtains the inference in (127b) from (127a). To illustrate, consider the schematic version of (127a) in (128).

- (128) EVERY x, x did SOME

In constructing the alternatives for (128) we can do three things, given the constraints above: first, we can start from the most embedded scalar item *some* and substitute it with the stronger scale-mates *every* and \perp and obtain the set of similar alternatives in (129).¹⁰

- (129) {EVERY x, x did EVERY, EVERY x, \perp }

Second, we can now apply a further transformation on the members of (129), but it has to be the same exact transformation for each member. In particular, we can substitute *every* with the weaker *some* and obtain (130).

- (130) {SOME x, x did EVERY, SOME x, \perp }

Finally, we can start, instead, from the least embedded scalar item in (128), substitute it with *some* and \top and obtain the set in (131). Notice that we cannot do anything else, given the constraint that the second transformation should not apply at a most embedded level than the first.

- (131) {SOME x, x did SOME, \top }

¹⁰We can also substitute it with the weaker \top , but this creates a singleton set so we can ignore it.

In sum, from (127a) we obtain the three set of alternatives in (132a)-(132c).

- (132) a. $\{\text{EVERY } x, x \text{ did EVERY, EVERY } x, \perp\}$
 b. $\{\text{SOME } x, x \text{ did EVERY, SOME } x, \perp\}$
 c. $\{\text{SOME } x, x \text{ did SOME, } \top\}$

For each of these set, the epistemic similarity principle applies and requires the alternatives to have the same status in the speaker's mind. From (132a), we predict that the speaker believes that not everyone did every readings, as show in (133), while from (132b) we obtain the stronger inference that no student did every readings. Finally from (132c) we obtain that someone did some of the readings, which is already entailed by the assertion.

$$(133) \quad B_s[\text{EVERY, } x \text{ did EVERY} \leftrightarrow \perp] = \\ B_s \neg [\text{EVERY, } x \text{ did EVERY}]$$

$$(134) \quad B_s[\text{SOME, } x \text{ did EVERY} \leftrightarrow \perp] = \\ B_s \neg [\text{SOME, } x \text{ did EVERY}] = \\ B_s [\neg \exists x \text{ did EVERY}]$$

The prediction for the case of a strong scalar item embedding a weak are, therefore, correct. Notice, however that the stronger inference that *no one did every readings* is crucially obtained given the further replacements of the alternatives of *every*. Given that Chemla (in preparation) assumes that *no* does not have any scale-mate he cannot predict the corresponding inference from (135a) to (135b).

- (135) a. No one did every reading.
 b. Everyone did some reading.

As I have shown in CHAPTER 4, Appendix A, for (135a) we can only obtain the existential inference in (136) and not the universal one in (135b).

(136) Someone did some reading.

To see this consider (137a) with the only possible set of similar alternatives in (137b).

(137) No student did all of the readings.

(137) {NO x, SOME, NO x, \top }

From (137b) we can only obtain the existential inference that the speaker believes that someone did some of the readings, as shown in (138).

(138) $B_s[\text{NO } x, \text{SOME} \leftrightarrow \text{NO } x, \top] =$
 $B_s[\text{NO } x, \text{SOME} \leftrightarrow \perp] =$
 $\neg B_s[\text{NO } x, \text{SOME}] =$
 $B_s \neg[\text{NO } x, \text{SOME}] =$
 $B_s[\exists x, \text{SOME}]$

As discussed in CHAPTER 4, Appendix A, the problem is that the system can never predict the universal inference (135b) from (135a).

Turning to the case of weak embedding strong like (139a), Chemla's (in preparation) system correctly blocks the non attested inference in (139b).

(139) a. Someone did every readings.
b. Someone didn't do any reading.

To see this consider the schematic version of (139a) in (140) and the derivation in (141).

(140) SOME x, EVERY

(141) a. Replacing the most embedded item *every*:

$B_s[\text{SOME}[\text{SOME}] \leftrightarrow \text{SOME}[\top]]$ already entailed by the sentence

b. Further replace the less embedded item *some*:

$B_s[\text{EVERY}[\text{SOME}] \leftrightarrow \text{ALL}[\top]]$ i.e. everyone did some.

- c. Replacing the less embedded item *some* alone:

$B_s[\text{EVERY}[\text{EVERY}] \leftrightarrow \perp]$ i.e. Not everyone did every reading.

In the case of a weak scalar term embedding a strong Chemla's (in preparation), therefore, does not over generate. Notice that it predicts a novel different inference for a case like (139a), which is that everyone did some readings. I am not sure whether this is an inference of (139a), but it is fair to say that it does not appear problematic as (139b) does.

Finally, Chemla's (in preparation) does not run into the under-generation problem. In other words, it predicts the distributive inferences in (142b) and (142c) from (142a).

- (142) a. Every student took syntax or semantics.
b. Some student took syntax.
c. Some student took semantics.

To illustrate, consider the schematic version of (142a) in (143).

- (143) EVERY(SYN OR SEM)

The alternatives that we obtain are in (144a) and (144b).

- (144) a. $\{\text{EVERY}[\text{SYN}], \text{EVERY}[\text{SEM}]\}$ connective split
b. $\{\text{EVERY}[\text{SYN AND SEM}], \text{EVERY}, \perp\}$ stronger replacements
c. $\{\text{SOME}[\text{SYN}], \text{SOME}[\text{SEM}]\}$ second weaker replacements on (144a)

The inferences that we obtain from (144a)-(144c) are in (145a)-(145c).

- (145) a. $B_s[\text{EVERY}(\text{SYN AND SEM})] \leftrightarrow B_s[\perp]$ i.e. $\neg B_s[\text{EVERY}(\text{SYN AND SEM})]$
b. $B_s[\text{EVERY}(\text{SYN})] \leftrightarrow B_s[\text{EVERY}(\text{SEM})]$
c. $B_s[\text{SOME}(\text{SYN})] \leftrightarrow B_s[\text{SOME}(\text{SEM})]$

Given that we conclude that it's false that the speaker believes that every student took both syntax and semantics, we can conclude (146) from (145b): it's false that the speaker believes that every student took syntax and it's false that the speaker believes that every student took semantics.

(146) $\neg B_s[\text{EVERY}(\text{SYN})]; \neg B_s[\text{EVERY}(\text{SEM})]$

From (146) and the assertion we can conclude that the speaker believes that some student took syntax and some student took semantics. In the same way from the assertion and (145c) we can conclude the same thing. Finally, nothing blocks strengthening the inferences in this case so we get the right prediction that the speaker believes that every student took syntax or semantics and that some student took syntax and some student took semantics.

Summing up, Chemla (in preparation)'s system does not predict non-attested inferences in the case of a weak scalar item embedding a strong one and it does not undergenerate in the case of a universal quantifier embedding a disjunction. As discussed above, however, it does not predict the inference from (147a) to (147b).

- (147) a. No one did every reading.
 b. Everyone did some reading.

More precisely, it would predict this inference, as I have shown in CHAPTER 4, appendix A, if we amend it by adding the alternatives for negative quantifiers that I proposed in CHAPTER 3 (i.e., *not every* as an alternative of *no*). In fact, it is actually unclear why, given the motivations in chapter 3, section 3.6 we should not have them. However, if we add this alternative to his system, we would loose his account of the difference between the universal inference in (147b) from (147a) and the corresponding inference in the case of presuppositions like in (148b) from (148a).

- (148) a. No one won.
 b. Everyone participated.

6.8 Conclusion

Scalar items in non-monotonic contexts and existential modals require including logically independent alternatives in scalar reasoning. However, I showed above that these alternatives create cases of under- and over-generation. I proposed a recursive procedure for computing which alternatives are excludable, which takes care of the over-generation problem. I also outlined possible solutions to the under-generation problem and some open problems that they have. Contrary to Fox's (2007) and Chemla's (in preparation), the present proposal predicts the possibility of the inference in (149b), from (149a). I argued above that this constitutes an argument in its favor.

- (149) a. None of these professors killed all of their students.
 b. Each of these professors killed some of their students.

6.9 Appendix A: free choice without exclusivity inference

Simons (2005) shows that there are cases of free choice in which we do not draw an exclusivity inferences. In other words, (150a) would get the interpretation in (150b) and not the one in (150c).

- (150) a. You may have the cake or the ice-cream
 b. You may have the cake and you can have the ice-cream and you are allowed to take both
 c. You may have the cake and you can have the ice-cream and you are not allowed to take both

Fox (2007) provides a way to account also for this case. He proposes that each disjunct is first exhaustified, before the disjunction is exhaustified twice. For what is relevant here, the same problem for a theory based on Excl_{st} arises. Let's look at the derivation in brief. First, the alternatives over which each disjunct is exhaustified are the following in (151) and the LF of the

disjunction is in (152).

$$(151) \quad \mathcal{Alt}_{3,4} = \left\{ \begin{array}{c} p \\ q \end{array} \right\}$$

$$(152) \quad \text{EXH}_{\mathcal{Alt}_2}[\text{EXH}_{\mathcal{Alt}_1}[\Diamond[\text{EXH}_{\mathcal{Alt}_3}[p] \vee \text{EXH}_{\mathcal{Alt}_3}[q]]]]$$

At the very first exhaustification of each disjuncts below the modal there is no problem. But the problem is coming later at the level of the second exhaustification.

$$(153) \quad \text{a.} \quad \text{EXH}_{\mathcal{Alt}_3}[p] = p \wedge \neg q$$

$$\text{b.} \quad \text{EXH}_{\mathcal{Alt}_3}[p] = q \wedge \neg p$$

$$(154) \quad \mathcal{Alt}_1 = \left\{ \begin{array}{l} \Diamond[\text{EXH}_{\mathcal{Alt}_3}[p] \vee \text{EXH}_{\mathcal{Alt}_4}[q]] = \Diamond[(p \wedge \neg q) \vee (q \wedge \neg p)] \\ \Diamond[\text{EXH}_{\mathcal{Alt}_3}[p]] = \Diamond[p \wedge \neg q] \\ \Diamond[\text{EXH}_{\mathcal{Alt}_4}[q]] = \Diamond[q \wedge \neg p] \\ \Diamond[\text{EXH}_{\mathcal{Alt}_3}[p] \wedge \text{EXH}_{\mathcal{Alt}_4}[q]] = \Diamond[(p \wedge \neg q) \wedge (q \wedge \neg p)] = \perp \end{array} \right\}$$

$$(155) \quad \mathcal{Alt}_2 = \left\{ \begin{array}{l} \text{EXH}_{\mathcal{Alt}_1}[\Diamond[(p \wedge \neg q) \vee (q \wedge \neg p)]] \\ \text{EXH}_{\mathcal{Alt}_1}[\Diamond[p \wedge \neg q]] \\ \text{EXH}_{\mathcal{Alt}_1}[\Diamond[q \wedge \neg p]] \\ \text{EXH}_{\mathcal{Alt}_1}[\Diamond[(p \wedge \neg q) \wedge (q \wedge \neg p)]] \end{array} \right\}$$

Again the crucial step is here in exhaustifying the two alternatives $\Diamond[p \wedge \neg q]$ and $\Diamond[q \wedge \neg p]$. If you do not consider logically independent alternatives, the only stronger one is the contradiction (the negation of which is obviously vacuous). On the other hand if you consider non-weaker alternatives you get the right alternatives that at the next round gives you free choice.

$$(156) \quad \text{a.} \quad \text{EXH}_{\mathcal{Alt}_1}[\Diamond[p \wedge \neg q]] = \Diamond[p \wedge \neg q] \wedge \neg \Diamond[q \wedge \neg p]$$

$$\text{b.} \quad \text{EXH}_{\mathcal{Alt}_1}[\Diamond[q \wedge \neg p]] = \Diamond[q \wedge \neg p] \wedge \neg \Diamond[p \wedge \neg q]$$

$$(157) \quad \text{EXH}_{\mathcal{Alt}_2}[\text{EXH}_{\mathcal{Alt}_1}[\Diamond[\text{EXH}_{\mathcal{Alt}_3}[p] \vee \text{EXH}_{\mathcal{Alt}_3}[q]]]] = \Diamond[(p \wedge \neg q) \vee (q \wedge \neg p)] \wedge \Diamond[p \wedge$$

$$\neg q] \wedge \Diamond[q \wedge \neg p]$$

6.10 Appendix B: scalar terms not in a c-command relation

The proposal in this chapter is based on a notion of c-command. The question is how should we extend this account to sentences like (158) in which more than one scalar item is present but some or all of them are not in a c-command relation.

- (158) **Some** of the students who finished **every** question in the first part completed **every** question in the second part.

First, we need to revise the notion of most embedded scalar item to accommodate sentences like (158).

- (159) **Most-embedded scalar item (second version)** A scalar item embeds another if it c-commands it. A scalar item X is the most embedded scalar item in a sentence ϕ iff for all scalar item Y in ϕ , either (a) or (b):
- a. Y c-commands X
 - b. Y doesn't c-command X and X doesn't c-command Y

(159) can account for the cases in which some scalar items are in the relevant WEAK[STRONG] or STRONG[WEAK] relation, while there is also another scalar item in the sentence that is not in a c-command relation with them. This is for instance the case in (160), for which again we do not want to conclude (161b) by excluding the alternative in (161a). In other words, we want to still block a WEAK[STRONG] case, even if there are other scalar terms in the sentence.

- (160) Some of the students who took syntax or semantics passed every first year exam.
- (161) a. Each of the students who took syntax or semantics passed some first year exam.
b. Some of the students who took syntax or semantics didn't pass any first year exam.

Furthermore, there is a question as to whether among the scalar terms that are not in a c-command relation present a pattern so that we have to allow some configurations and exclude others. The configurations here of course cannot be in terms of c-command, but could be for instance in terms of linear order. While the judgments are very delicate, it appears that neither if *strong* precedes *weak* nor if *weak* precedes *strong* we should have the inference corresponding to the exclusion of the logically independent alternative obtained by replacing both scalar items. I leave a more in depth exploration of these cases for further research.

- (162)
- a. the boys with **all** of their ducks on one side have **some** of their frogs on the other
 - b. **alternative**: the boys with **some** of their ducks on one side have **all** of their frogs on the other
 - c. **Scalar Implicature?**: the boys with **some** of their ducks on one side do not have **all** of their frogs on the other
- (163)
- a. the boys with **some** of their ducks on one side have **all** of their frogs on the other
 - b. **alternative**: the boys with **all** of their ducks on one side have **some** of their frogs on the other
 - c. **Scalar Implicature?**: the boys with **all** of their ducks on one side have **none** of their frogs on the other

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